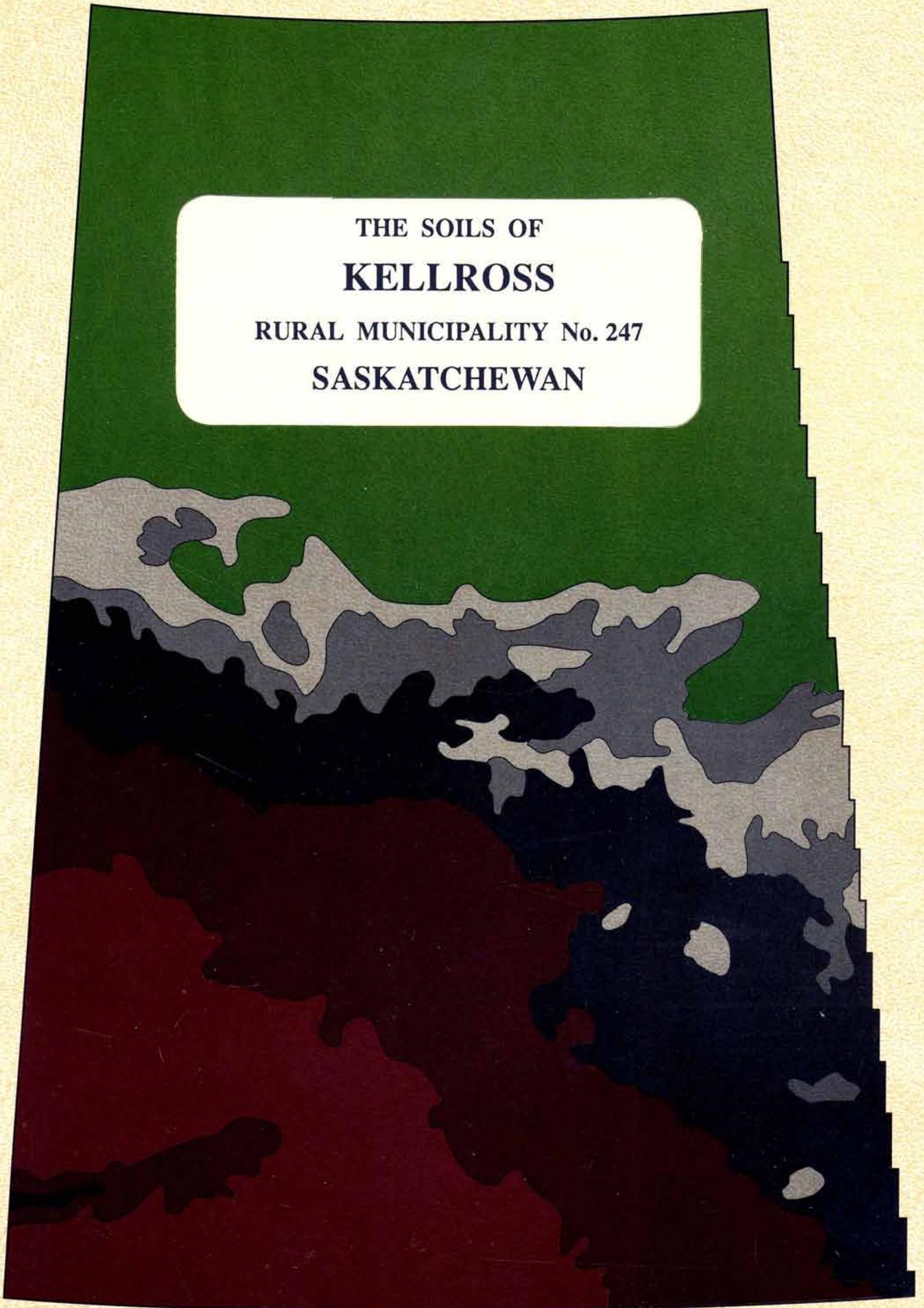


THE SOILS OF
KELLROSS

RURAL MUNICIPALITY No. 247

SASKATCHEWAN



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KELLROSS
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SASKATCHEWAN
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by

**Staff, Saskatchewan Soil Survey
SASKATCHEWAN INSTITUTE OF PEDOLOGY
University of Saskatchewan**



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Canada**

**Research
Branch**

STAFF, SASKATCHEWAN SOIL SURVEY

Map and Report Compilation: R.D. Stushnoff

Program Directors: D.W. Anderson, Director, H.P.W. Rostad, Associate Director, Saskatchewan
Institute of Pedology, Saskatoon

Soil Correlation: H.B. Stonehouse

Project Supervisors: L.M. Kozak and R.D. Stushnoff

Soil Mapping: M.D. Bock, D.D. Cerkowniak, H.C. de Gooijer, J.D. Robinson, C.T. Stushnoff and
F. Youatt

Secretarial: S.S.M. Wood

Drafting: P.M. Sardinha

Geographical Information System: S.R.E. Johnson

Laboratory: B.G. Goetz, J.D. Key and C.L. MacCuish

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1. INTRODUCTION

This publication continues the series of soil survey reports for Saskatchewan initiated on an R.M. basis in 1984. This series of publications is a continuation of the basic soil survey program in the Province, initiated in 1958; however, the publication format has been substantially changed to include more interpretive information on an R.M. basis.

The main purpose of a soil survey is to inventory the soil resources of an area, providing a description of the soils and showing their extent and distribution. It has become increasingly apparent, however, that many users require additional interpretive information for the resolution of production, conservation and other problems related to a particular set of soil conditions. To that end, this report also presents a number of interpretations based on the soil inventory information.

In order to gain the most information about any particular area within the municipality, both the soil map and report must be used together.

1.1 USING THE SOIL MAP AND REPORT

Each delineation on the soil map contains a map symbol and a unique number which are described and illustrated below.

The Soil Map Symbol

The map symbol is made up of a soil association code, a map unit number, and in some cases a substrate modifier code, along with a surface texture code in the numerator and a code composed of numbers and letters indicating the slope class and surface form of the landscape in the denominator. A brief explanation of each of these map symbol components is provided in the legend on the side of the map. The legend describes the general type of soil development, the geologic material in which each soil has developed, and in complex areas, where each geologic material occurs in the landscape, as well as the kinds of soils comprising each map unit.

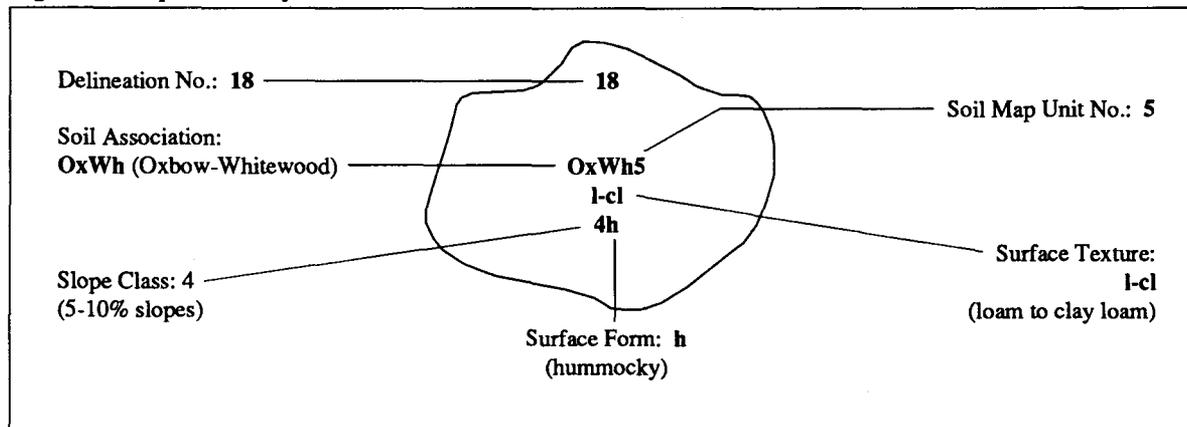
Delineation Number and Soil Interpretations

Each map delineation contains a unique number which is used to reference additional soils and interpretive information in Section 6 of the report. This section provides a tabular listing of interpretive symbols for each delineation. An explanation of these symbols is provided under the appropriate subsection in Section 4 entitled "Soil Interpretations."

Example

To determine the agricultural capability classification for area 18 (used in the example below), turn to Section 6 and look up the number 18 listed in the left-hand column under the heading, "Area No.". Next, read across to the symbols listed in the column headed, "Agricultural Capability". These symbols are explained in Subsection 4.4, entitled, "Soil Capability for Agriculture".

Figure 1. Sequence of Symbols.



2. INTRODUCTION TO SOILS

The nature and agriculturally important properties of the soils of the area are described in succeeding sections of this report. The present section, largely adapted from H.C. Moss, in *A Guide to Understanding Saskatchewan Soils*, deals mainly with features common to most prairie soils.

2.1 THE SOIL PROFILE

A soil is a natural body that occupies a relatively thin section (usually less than a meter) of the earth's surface and consists of several layers or horizons which differ in appearance and composition from the underlying material. Its formation from the original geological deposit involves various physical, chemical and biological processes which result in the formation of individual layers or horizons, extending from the surface downwards, that have specific characteristics. The whole succession of layers down to and including the original geological deposit is called the **soil profile**. Each individual layer is called a **soil horizon**. A particular soil is recognized and separated from other soils by identifying the various layers or horizons which make up its profile. The recognition of soil profiles forms the basis of soil classification and mapping.

The soils of Saskatchewan are classified according to a national system of soil classification and the names given to the soils are derived, in part, from this system. For example, an orthic profile is a soil whose characteristics are defined as an Orthic Chernozemic soil of the National system.

In profiles of mineral soils, three main horizons are recognized. From the surface downward, these are designated by the letters A, B, and C. The A horizon forms all or part of the surface soil. It may be dark colored representing an accumulation of humus, or it may be a light-colored horizon from which clay, humus and other materials have been removed. The B horizon occurs immediately below the A horizon. It may have an accumulation of clay and may have been altered to give a change in color or structure. The C horizon occupies the lower portion of the soil profile and usually represents the parent material. It is relatively unaffected by soil forming processes operative in the A and B horizon.

2.2 THE SOIL MAP

Ideally, the area represented by each soil profile should be shown on the map. This, however, is only possible where large, uniform areas of a single soil occur, or in detailed soil surveys where small areas can be separated on the map. Since, on the semi-detailed maps, it is rarely possible to delineate areas of a single soil, it is almost always necessary

to combine small areas of several soils into a larger area. These larger areas are represented on the map by a map unit that identifies the kinds and distribution of the component soil profiles.

The **soil association** is used to show the relationship between map units that have formed on a similar geological deposit within a particular soil zone. The Oxbow Association, for instance, is the name given to a group of soil profiles formed on loamy glacial till occurring in the black soil zone. The various **map units** of the Oxbow Association reflect variations in the kind and distribution of Oxbow soils from one area to the next.

Where two geological deposits occur within a delineated area on the map, two associations are used. As an example, Meota-Oxbow is the name given to a group of soils of the Meota and Oxbow soil associations. Different map units of this complex are used to reflect variations in the kind and distribution of Meota and Oxbow soils from one area to the next. As an exception, areas in which several geological deposits occur in a somewhat chaotic and unpredictable pattern throughout the landscape are often given a single association name. For example, Keppel is the name given to soils formed in a highly complex mixture of loamy glacial till, silty water-modified glacial till and silty glaciolacustrine materials.

It is possible also to find soils reflecting the characteristics of two soil zones within a local area. Under these circumstances, two associations are used to reflect these different soil properties. For example, Black and Dark Gray soils that occur together are mapped in the Oxbow-Whitewood complex, the Oxbow referring to the Black soils and Whitewood to the Dark Gray soils.

The soil map, then, attempts to portray the kinds and distribution of various soil profiles throughout the municipality. The symbols on the map identify the soil map unit, the soil texture, the slope class and surface form. The map legend provides a brief description of these features. More complete descriptions of individual soil associations and their component soil types are provided in the Description of Soils section of the report. The types of geological deposits which comprise the parent materials of the various soil associations, the surface forms or shape of the land, and the soil's surface texture are described below.

2.3 SURFACE DEPOSITS

Alluvial Deposits - Alluvial deposits are materials laid down by streams and rivers, in valley bottoms and collection basins, since glaciation. These deposits are stratified and often contain beds or layers that are oblique to the main planes of stratification, indicative of their river or stream origin.

Eolian Deposits - Eolian deposits are sandy or silty deposits that have been moved and redeposited by the wind, often in the form of sand dunes or silty loessial veneers or blankets. Eolian deposits are well-sorted, poorly compacted and may contain beds or layers.

Fluvial Deposits - Fluvial deposits are materials laid down in rivers and streams carrying glacial meltwater. They are usually sandy or gravelly and, like the alluvial deposits described above, may contain beds or layers that are inclined or oblique to the main planes of stratification. These deposits are usually thick but may be thin, like a veneer, and underlain by glacial till. Materials laid down in direct contact with the glacier are termed *glaciofluvial*.

Lacustrine Deposits - Lacustrine deposits are materials laid down in a glacial lake. These deposits are often stratified and characterized by dark- and light-colored beds or layers reflecting summer and winter depositional cycles in a glacial lake. Lacustrine deposits usually have a high content of very fine sand-, silt- or clay-sized particles. Those dominated by sand-sized particles are termed *loamy lacustrine* while those dominated by silt- and clay-sized particles are termed *silty* and *clayey lacustrine*, respectively. They are usually thick but may be thin, like a veneer, and underlain by glacial till or gravel. Materials laid down in close contact with the glacier are termed *glaciolacustrine* deposits.

Morainal Deposits - Morainal deposits, often referred to as glacial till, are materials laid down by the glacial ice. These deposits are generally comprised of stones and gravels embedded in a matrix of sand-, silt- and clay-sized materials. When this matrix contains nearly equal amounts of sand, silt and clay they are called *loamy morainal* deposits. When there is a preponderance of sand or silt, they are referred to as *sandy morainal* or *silty morainal* deposits, respectively. Usually, there are fewer stones and gravels present in silty morainal deposits than in sandy or loamy types. Morainal deposits characterized by an abundance of surface stones are called *bouldery morainal* deposits.

Organic Deposits - Organic deposits are materials laid down by the accumulation of plant remains. They are generally 40 cm thick or greater and are comprised of either the remains of mosses or sedges and grasses and often have inclusions of woody materials. When the organic materials are largely undecomposed, so that there is a large amount of well-preserved fiber that is readily identifiable as to botanical origin, they are called *fibric organic* deposits. When the organic materials are in an intermediate stage of decomposition, so that there is an intermediate amount of fiber that is identifiable as to botanical origin, they are called *mesic organic* deposits. Highly decomposed materials, which have a small amount of fiber that can be identified as to botanical origin, are called *humic organic* deposits.

Undifferentiated Deposits - Areas where the origin of the materials for the purpose of mapping has not been specified are termed undifferentiated deposits. These deposits, usually consisting of several materials (morainal, fluvial, lacustrine, or others) occur in areas of steeply sloping land such as coulees and valley sides.

2.4 SURFACE FORMS

Aprons and Fans - A fan is a gently sloping fan-shaped area, usually occurring at the base of a valley wall, resulting from the accumulation of sediments brought down by a stream descending through a steep ravine. A series of adjacent, coalescing fans is called an apron.

Hummocky - Landscapes with a complex pattern of generally short, steep slopes extending from prominent knolls to somewhat rounded depressions or kettles are termed hummocky. They are called *hummocky dissected* where shallow gullies join one low area or kettle to the next and *hummocky gullied* where numerous, parallel or subparallel, narrow ravines interrupt the hummocky features of the landscape. Occasionally, areas have a complex of ridged and hummocky features. They are called *hummocky-ridged*.

Inclined - Landscapes in which the general slope is in one direction only are called inclined. Where shallow gullies occur along the slope, the areas are called *inclined dissected*; where a series of parallel or subparallel, deep gullies or ravines occur, they are called *inclined gullied*.

Level - Landscapes that are flat or have very gently sloping surfaces are said to be level. Along flood plains of rivers and streams where the level surface is broken by abandoned river channels they are called *level channelled*.

Ridged - Landscapes that have a linear pattern, usually of short and straight parallel ridges but sometimes a single, sinuous ridge or a series of intersecting ridges are termed ridged.

Rolling - Landscapes that are characterized by a sequence of long (often 1.6 km or greater), moderate to strong slopes extending from rounded, sometimes confined depressions to broad, rounded knolls, that impart a wave-like pattern to the land surface are called rolling. They are called *dissected rolling* where shallow gullies join one low area or kettle to the next.

Terraced - Areas, usually along a valley, that have a steep, short scarp slope and a horizontal or gently inclined surface above it are called terraced.

Undulating - Landscapes that are characterized by a sequence of gentle slopes extending from smooth rises to gentle hollows, that impart a wavelike pattern to the land surface are called undulating. Where shallow gullies extend from one low area to the next in these landscapes they are called *undulating dissected* and where the undulating surface is broken by abandoned river channels they are called *undulating channelled*.

2.5 SURFACE TEXTURE

Mineral soil is a mixture of various-sized mineral particles, decaying organic matter, air and water. The mineral particles, exclusive of stones and gravel, may be grouped into three particle-size fractions: sands (soil particles between 0.05 and 2 mm in diameter), silts (soil particles between 0.002 and 0.05 mm in diameter), and clays (soil particles less than 0.002 mm in diameter). The relative proportions of these particle-size fractions in a soil determine its texture. The textural triangle (Figure 2) is used to illustrate the proportion of sand, silt and clay in the main textural classes. The vertical axis is percent clay, the horizontal axis is percent sand, while the remainder of each class is percent silt. Thus, when sand is dominant, it yields a sandy- or coarse-textured soil, whereas a fine-textured soil is made up largely of silt and clay. The terms "light" and "heavy" are often used to refer to sandy- and clayey-textured soils respectively, and are actually a measure of the power required to till the soil. These terms have nothing to do with the actual weight of soil, as a given volume of dry sand actually weighs slightly more than that of clay.

Table 1. Soil texture classes.

Symbol	Soil Texture Class
Coarse-Textured	
gs	Gravelly sand
s	Sand
fs	Fine sand
gls	Gravelly loamy sand
ls	Loamy sand
lfs	Loamy fine sand
Moderately Coarse-Textured	
gsl	Gravelly sandy loam
gl	Gravelly loam
sl	Sandy loam
fl	Fine sandy loam
vl	Very fine sandy loam
Medium-Textured	
scl	Sandy clay loam
fcl	Fine sandy clay loam
vcl	Very fine sandy clay loam
l	Loam
Moderately Fine-Textured	
sil	Silt loam
cl	Clay loam
sicl	Silty clay loam
Fine-Textured	
c	Clay
sic	Silty clay
hc	Heavy clay
Miscellaneous	
o	Organic
U	Unclassified

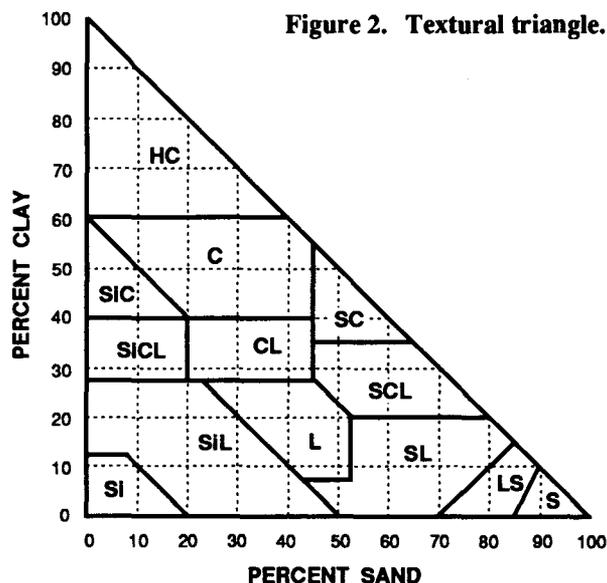
Textural class names such as sandy loam, clay loam, heavy clay, etc., are given to soils based upon the relative proportions of sand, silt and clay. Three broad, fundamental textural groups are recognized: sands, loams and clays.

SANDS - The sand group includes soils in which the sand particles make up at least 70% of the material by weight. Two main classes are recognized: sand and loamy sand. Sands are further broken down into different sand sizes such as fine sand or coarse sand. A description of these is found under "Sand" in the glossary.

LOAMS - The loam group is intermediate in texture between the coarse-textured sands and the fine-textured clays, and these soils usually contain a significant proportion of each particle-size fraction. Class names include: sandy loam, silt loam, silty clay loam, sandy clay loam, clay loam and loam.

CLAYS - The clay group includes soils that contain at least 35% clay-size particles, and in most cases, more than 40%. Class names are : sandy clay, silty clay, clay and heavy clay. Soils of this group are often referred to as "gumbo".

Table 1 lists the surface textures and symbols that may be used in this report, grouped into particle-size categories. The miscellaneous category contains two non-texture entries. The "o" or organic soil texture class is used for organic soils. By definition, these soils do not contain any mineral component and, therefore, do not have a surface texture as defined and described above. The symbol "o" merely identifies the surface as being organic. The "U" or unclassified class is used for areas in which surface texture has not been determined. These include areas that have been greatly altered (such as gravel pits or mines), most wetlands and lakes, areas that have not been examined (such as towns and cities), and areas of extremely variable texture (such as some Hillwash or Runway delineations).



3. DESCRIPTION OF SOILS

BALCARRES (Ba) SOILS

Balcarres soils are Black soils that have formed in clayey lacustrine materials. Surface textures range from clay loam to silty clay.

Balcarres soils are typically stone free, however, a few stones may occur where the lacustrine materials are shallow (less than 1 m thick) and underlain by glacial till or gravel. These soils are typically associated with undulating and undulating dissected landscapes having very gentle and gentle slopes. Many of these landscapes, especially those without external surface drainage, are characterized by the presence of imperfectly to poorly drained sloughs and local flats or depressional areas.

Balcarres soils frequently occur in complex with soils of other associations. In most of these complexes, the Balcarres soils tend to occur on the mid- and lower slope positions.

Kinds of Balcarres Soils

Orthic Balcarres - The orthic Balcarres soil can occur in any landscape position. It is a well-drained soil with a black A horizon, 10 to 20 cm thick, underlain by a dark-brown, lime-free B horizon and a moderately calcareous, grayish-brown C horizon.

Calcareous Balcarres - The calcareous Balcarres soil occurs on locally dry upper slopes and knolls, but can also occur on well-drained mid- and lower slope positions. It is a well-drained soil characterized by a black, usually calcareous A horizon underlain, in turn, by a grayish-colored, moderately calcareous C horizon.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas which collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought.

Agricultural Properties of Balcarres Soils

Balcarres soils are very good agricultural soils of capability class 1. Their clay loam and clay textures result in a high water-holding capacity and, thus, they have good drought resistance. These soils may be downrated based on soil and landscape limitations (i.e. salinity, topography, wetness, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Balcarres soils are naturally fertile and are reasonably easy to keep in good tilth. They have a high amount of organic matter in the A horizon, are low in available phosphorus and high in available potassium. Crops grown on these soils usually respond to additions of nitrogen and phosphorus fertilizers. Stones are usually absent in these soils, however, they may be present in areas where the underlying glacial till is in close proximity to the surface. Wind erosion can be a problem, unless cultural practices that maintain a rough surface and a trash cover are utilized to minimize the risk. Water erosion is generally not a problem because of the gently sloping landscape. Balcarres soils that occur on a relatively flat landscape with some slight depressions may be subject to temporary flooding in the spring or after periods of intense rainfall due to the low infiltration rate of these soils.

CUDWORTH (Cd) SOILS

Cudworth soils are Black soils that have formed in highly calcareous, silty lacustrine materials. Surface textures are mostly loam, silt loam, and silty clay loam.

Cudworth soils are typically stone free, however, where the lacustrine materials are shallow (less than 1 m thick) and overlie gravel or eroded glacial till, a few stones may occur. These soils usually occur on very gently to gently sloping, undulating landscapes, or gently to moderately sloping, hummocky landscapes.

Cudworth soils frequently occur in complex with soils of other associations. In most of these complexes, the Cudworth soils occupy the mid- and lower slope positions.

Kinds of Cudworth Soils

Orthic Cudworth - The orthic Cudworth soil occupies mid- and lower slope positions in most Cudworth landscapes. It is a well-drained soil with a black A horizon, 12 to 18 cm thick, underlain by a brown, lime-free B horizon and a strongly calcareous C horizon.

Gleyed Orthic Cudworth - The gleyed orthic Cudworth soil occurs on mid- and lower slope positions in most Cudworth landscapes. It is a moderately well- to imperfectly drained soil characterized by a black A horizon, 11 to 19 cm thick, underlain by B and C horizons that often have dull colors and reddish spots and stains, indicative of restricted drainage.

Calcareous Cudworth - The calcareous Cudworth soil is a well-drained soil that occurs mainly on upper slopes and knolls in most Cudworth landscapes, but can also occur on lower slopes. It has a black A horizon that is often calcareous, is 11 to 18 cm thick, and is underlain by a brownish to grayish-brown, calcareous B horizon and a grayish-colored, strongly calcareous C horizon.

Weakly Developed Cudworth - The weakly developed Cudworth soil occurs on upper slopes and knolls and is usually affected by erosion to some degree. It is a well-drained soil, characterized by a black, usually calcareous A

horizon, 13 to 19 cm thick, underlain by a grayish-colored, strongly calcareous C horizon.

Eroded Cudworth - The eroded Cudworth soil is a soil whose topsoil has been partially or almost totally removed by erosion. It occurs on knolls and upper slopes and can be easily recognized in cultivated fields by its light-brown to grayish-colored surface. It occurs most often in hummocky landscapes with moderate to steep slopes.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas which collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Cudworth Soils

The majority of Cudworth soils, with a loam to silt loam surface texture, are good agricultural soils of capability class 2. A slight moisture deficit, imparted by a moderate water-holding capacity and the subhumid regional climate, is their main limitation to the production of common field crops. Cudworth soils may be further downrated based on other soil and landscape limitations (i.e. salinity, topography, wetness, etc.) that are peculiar to an individual delineation. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

These soils have a high amount of organic matter in the A horizon, and are reasonably easy to keep in good tilth. The natural fertility of these soils is good, although they will respond to additions of nitrogen and phosphate fertilizers. Stones are generally not a problem, however, where gravel or eroded till occur near the surface, some stones may be present and occasional clearing may be required. Wind erosion can be a serious problem unless cultural practices that maintain a trash cover are utilized. Such practices include reduced tillage or leaving stubble standing, continuous cropping, or the establishment of forages in seriously affected areas. Similarly, water erosion can be a problem, especially on long slopes, during periods of intense rainfall or high runoff. Management practices, such as cultivation across slopes and grassing of runways, should be followed as much as possible.

CRAIGMORE (Cm) SOILS

Craigmore soils are Black soils that have formed in a complex mixture of silty glaciolacustrine materials, loamy glacial till and silty water-modified glacial till. Surface textures are predominantly loam and silt loam, but can range to clay loam and silty clay loam.

Craigmore soils are usually stone free to slightly stony, however, stoniness can be extremely variable. Craigmore soils formed in the glaciolacustrine materials are often stone free, whereas those formed in the glacial tills can range from slightly stony to exceedingly stony. These soils usually occur on hummocky landscapes with moderate to steep slopes. Craigmore landscapes differ somewhat from the typical morainal landscape in that some of the knolls have longer slopes, are broader, and are nearly level on top.

Craigmore soils occasionally occur in complex with soils of other associations. In most of these complexes, the Craigmore soils tend to be distributed randomly throughout the landscape.

Kinds of Craigmore Soils

Orthic Craigmore - The orthic Craigmore soil occurs on mid- and lower slope positions in most Craigmore landscapes. It is a well-drained soil characterized by a black A horizon, 12 to 20 cm thick, underlain by a brownish B horizon and a grayish, moderately calcareous C horizon.

Calcareous Craigmore - The calcareous Craigmore soil occurs most often on locally dry upper slopes and knolls where runoff reduces the amount of water entering the soil. This generally results in a thinner soil with less organic matter than Craigmore soils on mid- and lower slopes. It is a well-drained soil characterized by a black, usually calcareous A horizon, 10 to 20 cm thick, underlain by a thin, calcareous B horizon and a grayish, moderately calcareous C horizon. This soil is often affected by erosion but the extent of erosion is less than on the eroded Craigmore soil.

Eroded Craigmore - The eroded Craigmore soil, as the name implies, is a Craigmore soil whose topsoil has been partially or almost totally removed by erosion. It occurs on upper slopes and knolls and can be easily recognized in cultivated fields by its light-brown to grayish-colored surface. It occurs most often in hummocky landscapes with moderate to steep slopes.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Craigmore Soils

The best Craigmore soils, those with clay loam surface textures, are very good agricultural soils of capability class 1. The more common Craigmore soils, those with loam surface textures, are good agricultural soils of capability class 2; a

slight moisture deficit, imparted by a moderate water-holding capacity and the subhumid regional climate, is their main limitation. Craigmores soils are often downrated based on other soil and landscape limitations (i.e. topography, erosion, stones, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Most Craigmores soils have a moderate to high amount of organic matter in the A horizon, resulting in reasonably fertile soils of good tilth. Where Craigmores soils occur on landscapes with gentle slopes, they have a low susceptibility to wind and water erosion. However, these soils frequently occur on landscapes with moderate to steep slopes; consequently, they often have a high to very high susceptibility to water erosion. The eroded Craigmores soils on steep knolls have low nutrient reserves and are locally dry because of the rapid runoff associated with these slopes. Where Craigmores soils have undergone severe erosion or where they are very susceptible to erosion, it is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, grassing runways, cultivating across slopes, and establishment of forages, be utilized to control soil erosion. It is very difficult to farm landscapes with strong to steep slopes and often the only way to effectively control erosion is to have a root system permanently in place, such as through standing stubble or forages. Craigmores soils range from stone free to exceedingly stony, hence, the number of annual clearing operations will vary considerably.

GLENBUSH (Gb) SOILS

Glenbush soils are Dark Gray soils that have formed in gravelly fluvial materials, in areas of mixed grassland and forest, where wooded vegetation has had some influence on soil formation. Surface textures usually range from loamy sand to sandy loam or loam. Gravelly phases of these textures also occur in some areas.

These soils are usually slightly to moderately stony, however, stoniness can be more severe, especially in areas where the gravelly parent materials are shallow (less than 1 m thick) and overlie glacial till. Glenbush soils are often associated with hummocky landscapes having gentle to moderate slopes. Undulating landscapes with very gentle to gentle slopes and hummocky landscapes with strong or steep slopes are also common in some areas.

Glenbush soils frequently occur in complex with soils of other associations. In many areas of these complexes, the Glenbush soils occur randomly throughout the landscape, whereas in other areas, they occur in a more regular pattern, often occupying the upper slopes and knolls.

Kinds of Glenbush Soils

Orthic Glenbush - The orthic Glenbush soil occurs on all slope positions, provided there is adequate drainage and no erosion. It is a well- to rapidly drained soil with a dark

gray-colored A horizon, 10 to 17 cm thick, underlain by a brownish-colored B horizon of variable thickness which overlies a grayish-colored, weakly calcareous C horizon.

Peaty Poorly Drained Soils - Peaty poorly drained soils occur mainly in sloughs and low-lying depressional areas. They are characterized by a shallow layer of peaty material, from 15 to 40 cm thick, that overlies a dark-colored A horizon. The underlying horizons have drab colors that often include reddish spots and stains, indicative of formation under poorly drained conditions. When the organic material is primarily fibric peat, the organic layer may be up to 60 cm thick. Unless artificially drained, most of these soils are frequently wet for all or a significant portion of the growing season and are often flooded.

Agricultural Properties of Glenbush Soils

The Glenbush soils are fair agricultural soils of capability class 3. Their loam to sandy loam textures, coupled with a gravelly subsoil, result in a low water-holding capacity. The coarser-textured Glenbush soils, those with gravelly sandy loam or loamy sand surface textures, are considered to be poor agricultural soils of capability class 4. These soils may be downrated further based on other soil and landscape limitations (i.e. salinity, topography, stones, etc.) that are peculiar to an individual delineation. For example, Glenbush soils occurring in eroded channels may be so stony that extensive clearing may be required before they can be cultivated. These soils are usually rated as capability class 5. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Glenbush soils generally have a moderate amount of organic matter in the A horizon but, nevertheless, tend to be relatively infertile. In addition to applications of nitrogen and phosphorus, additions of potassium and sulphur may benefit some crops. These soils have a moderate to high susceptibility to wind erosion due to their sandy nature. Soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, strip cropping and shelterbelts, should be used to provide dependable protection from wind erosion. Frequent inclusion of forages in crop rotations will help to maintain or enhance the organic matter content as well as provide protection from erosion.

Glenbush soils vary from slightly to moderately stony, often requiring periodic removal.

GLENAVON (Gn) SOILS

Glenavon soils are Black soils that have formed in a mixture of loamy glacial till, and silty to clayey glaciolacustrine materials. They are associated with a unique landscape consisting of hummocky glacial till in which saucer-shaped plateaus of silty or clayey glaciolacustrine materials occur. These plateaus are usually surrounded by circular ridges, the outside edges of which drop sharply into elongated, often crescent-shaped sloughs. Surface textures are predomi-

nantly loam and clay loam, and occasionally clay on the glaciolacustrine plateaus.

Glenavon soils are slightly to moderately stony, although the glaciolacustrine areas may be nonstony. These soils occur on hummocky landscapes with extremely variable slopes. Slopes range from moderate to strong in the glacial till segments to nearly level on the glaciolacustrine segments of the landscape.

Kinds of Glenavon Soils

Orthic Glenavon - The orthic Glenavon soil occurs on lower to upper slopes in most Glenavon landscapes. It is a well-drained soil with a black A horizon, 10 to 20 cm thick, underlain by a brown B horizon and a grayish- or brownish-colored, moderately calcareous C horizon.

Calcareous Glenavon - The calcareous Glenavon soil occurs on upper slopes, knolls and circular ridges. It is similar to the orthic, except that the A horizon is thinner, and the B horizon is calcareous and has a grayish-brown color. This soil is often slightly eroded on knolls.

Eroded Glenavon - The eroded Glenavon soil, as the name implies, is a Glenavon soil whose topsoil has been partially or totally removed by erosion. It occurs on upper slopes and knolls and commonly on the crests of the circular ridges. It is easily recognized in cultivated fields by its light-brown to grayish-colored surface. It occurs most often in hummocky landscapes with moderate to steep slopes.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Glenavon Soils

Glenavon soils are good agricultural soils of capability class 2. A slight moisture deficit, imparted by a moderate water-holding capacity and the subhumid regional climate, is their main limitation. Glenavon soils are often downrated based on other soil and landscape limitations (i.e. topography, erosion, stones, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Most Glenavon soils have a moderate to high amount of organic matter in the A horizon, resulting in good fertility and tilth. Where Glenavon soils occur on gentle slopes they have a low susceptibility to wind and water erosion. However,

these soils frequently occur on landscapes with moderate to steep slopes; consequently, they are often very susceptible to water erosion. Wind erosion, while not usually a serious problem, does occur to varying degrees on the upper portions of steeper ridges. Attempts should be made to maintain a trash cover on these ridges so that the effect of wind erosion will be minimal. Where Glenavon soils have been severely eroded or where they are very susceptible to erosion, it is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, grassing runways, cultivating across slopes and the establishment of forages, be used to control soil erosion. Because it is difficult to farm landscapes with strong to steep slopes, often the only effective way to control erosion is to have a root system permanently in place, such as that provided by standing stubble or forages.

The circular plateaus are usually surrounded by slight ridges and thus have no external drainage. When runoff is high, the central portion of these areas may be subject to flooding for short periods of time. Stones are extremely variable over the landscape, ranging from none on the glaciolacustrine soils of the plateaus to moderate concentrations on the circular ridges. While periodic clearing is usually required, stones are not generally a serious problem.

HOODOO (Hd) SOILS

Hoodoo soils are Black soils that have formed in shallow (less than 1 m thick), highly calcareous, silty lacustrine materials underlain by glacial till. Surface textures are predominantly loam and silt loam, but can range to silty clay loam and clay loam.

Hoodoo soils are typically stone free to slightly stony, but may be moderately stony in areas where the lacustrine materials are very shallow, or where they occur in complex with glacial till or gravel. Hoodoo soils are usually associated with undulating or undulating dissected landscapes with very gentle to gentle slopes, but also occur on hummocky landscapes with gentle to moderate slopes, particularly where they occur in complex with soils formed in glacial till.

Hoodoo soils frequently occur in complex with soils of other associations. In most of these complexes, the Hoodoo soils occur on the mid- and lower slope positions.

Kinds of Hoodoo Soils

Orthic Hoodoo - The orthic Hoodoo soil usually occupies mid- and lower slope positions but may also occur on upper slopes. It is a well-drained soil characterized by a black A horizon, 13 to 19 cm thick, underlain by a distinct, brownish-colored, lime-free B horizon and a grayish-colored, strongly calcareous C horizon.

Calcareous Hoodoo - The calcareous Hoodoo soil occurs mainly on upper slopes and knolls but may also occur on mid- to lower slope positions. It is a well-drained soil characterized by a black, usually calcareous A horizon, 13 to

19 cm thick, underlain by a calcareous B horizon and a grayish-colored, strongly calcareous C horizon.

Weakly Developed Hoodoo - The weakly developed Hoodoo soil usually occurs on upper slopes and knolls where it may be eroded to some degree. It may also occur on mid- to lower slope positions in some landscapes. It is a well-drained soil characterized by a black, usually calcareous A horizon, 12 to 16 cm thick, underlain by a light grayish-colored, highly calcareous C horizon.

Eluviated Hoodoo - The eluviated Hoodoo soil occurs most often on lower slope positions. It is a well-drained soil characterized by a black A horizon, 14 to 18 cm thick, underlain by a dark-gray to gray, slightly platy, leached horizon. This horizon, in turn, is underlain by a dense, lime-free B horizon and a grayish-colored, strongly calcareous C horizon.

Carbonated Hoodoo - The carbonated Hoodoo soil usually occurs on lower slopes, frequently surrounding sloughs or poorly drained depressions, and on imperfectly to poorly drained flat or depressional areas. It is an imperfectly drained soil characterized by a highly calcareous A horizon, 17 to 23 cm thick, underlain by a highly calcareous B or C horizon. The B and C horizons often have dull colors and reddish spots and stains, indicative of imperfect soil drainage. Streaks of carbonate frequently occur throughout the upper horizons.

Saline Hoodoo - The saline Hoodoo soil occurs on lower slopes and in imperfectly to poorly drained depressions or along shallow drainage channels, where the upward movement of subsurface water results in the deposition of salts in upper horizons. Consequently, soluble salts are usually present within 50 cm of the surface. The salts occur as a light-colored surface crust or as small, white specks in the soil, although salts may not always be visible. Dull colors and reddish spots and stains, indicative of imperfect soil drainage, are often present in the subsoil. These soils frequently occur in association with carbonated Hoodoo soils.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Hoodoo Soils

Hoodoo soils are good agricultural soils with an agricultural capability rating of class 2. A slight moisture deficit, imparted by a moderate water-holding capacity and the subhumid regional climate, is their main limitation. These soils may be downrated based on other soil and landscape

limitations (i.e. salinity, topography, stones, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Most Hoodoo soils have a high amount of organic matter in the A horizon, making them reasonably fertile soils of good tilth. These soils are low in available phosphorus and high in available potassium. Crops grown on these soils respond to additions of phosphorus and nitrogen fertilizers.

Stones are seldom a problem on most Hoodoo soils, however, due to the presence of glacial till near the surface, occasional clearing may be required. Similarly, water erosion is seldom a problem, but can become serious during periods of intense rainfall due to the relatively low infiltration rate of these soils. The potential for water erosion is greatest in areas with long slopes; management practices such as cultivation across slopes and grassing of runways should be followed as much as possible. Wind erosion can be a serious problem unless conservation practices are followed. Such practices include maintenance of crop residues through reduced tillage or leaving stubble standing, continuous cropping, or the establishment of forages in seriously affected areas.

HILLWASH (Hw) SOILS

Hillwash soils are formed in various deposits associated with the steep and eroding sides of escarpments and valleys of rivers, creeks and tributaries. They are a group of shallow, eroded and weakly developed soils. Surface textures and amounts of stone are extremely variable because of the variable nature of the parent material and the association of these soils with steeply sloping, eroded landscapes.

Agricultural Properties of Hillwash Soils

Hillwash soils are primarily nonarable due to the nature of the landscape on which they occur. Steepness of slope and susceptibility to erosion are the main limitations. They do, however, have some value as pasture land, depending upon steepness of slopes, density of tree cover and availability of water. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

KAMSACK (Ka) SOILS

Kamsack soils are Dark Gray soils that have formed in silty lacustrine materials, where wooded vegetation has had an influence on soil formation. Surface textures are usually silt loam, but loam and clay loam textures can occur.

Kamsack soils are usually stone free, however, a few stones can occur in areas where these soils are shallow (less than 1 m thick) and underlain by a mixture of fluvial gravels and glacial till or eroded till. These soils commonly occur on undulating landscapes with very gentle to gentle slopes and on hummocky landscapes with slopes ranging from gentle to strong.

Kamsack soils frequently occur in complex with soils of other associations. In most of these complexes, the Kamsack soils tend to occur on mid- and lower slope positions.

Kinds of Kamsack Soils

Orthic Kamsack - The orthic Kamsack soil usually occurs on mid- to upper slopes. It is a well-drained soil with a dark grayish-brown A horizon, 11 to 20 cm thick, that overlies a brownish-colored B horizon and a grayish-colored, moderately to strongly calcareous C horizon.

Eroded Kamsack - The eroded Kamsack soil, as the name implies, is a Kamsack soil whose topsoil has been partially or almost totally removed by erosion. It occurs on upper slopes and knolls and is easily recognized by its lighter, grayish-colored A horizon. This A horizon is low in organic matter, is often calcareous and directly overlies the C horizon. It often occurs in hummocky landscapes with moderate to steep slopes and, in severely eroded areas, may occupy 30 percent or more of the landscape.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Kamsack Soils

Kamsack soils are generally very good to good agricultural soils of capability classes 1 and 2. A slight moisture deficit, imparted by the subhumid regional climate and a moderate water-holding capacity, is their main limitation. Kamsack soils are often downrated based on other soil and landscape limitations (i.e. salinity, wetness, topography, etc.) that are peculiar to individual delineations. Steepness of slope, for example, may reduce the agricultural capability of these soils to classes 3 or 4 in some areas. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Kamsack soils have a moderate amount of organic matter in the A horizon. Stones are generally not present in these soils, but where the lacustrine materials are shallow and underlain by gravel or eroded till, a few stones may occur and occasional clearing may be required. Wet conditions may be encountered on the imperfectly drained Kamsack soils in the spring, delaying cultivation and seeding operations.

These soils have a low susceptibility to wind erosion. Relatively low infiltration rates, when coupled with long slopes, however, can result in a high susceptibility to water erosion. It is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage

or leaving stubble standing, grassing runways, cultivation across slopes and establishment of forages, be utilized to control soil erosion.

LESTOCK (Le) SOILS

Lestock soils are Dark Gray soils that have formed in a complex mixture of silty glaciolacustrine materials, loamy glacial till and silty water-modified glacial till. Surface textures are predominantly loam and clay loam, but can range to silt loam and silty clay loam.

Lestock soils are usually slightly to moderately stony, however, they can range from stone free on the glaciolacustrine materials to stony on the glacial till. Lestock soils usually occur on hummocky landscapes with gentle to strong slopes.

Kinds of Lestock Soils

Orthic Lestock - The orthic Lestock soil occurs on mid- and lower slope positions in most Lestock landscapes. It is a well-drained soil characterized by a dark-gray A horizon, 15 to 25 cm thick, underlain by a brown B horizon and a grayish, moderately calcareous C horizon.

Calcareous Lestock - The calcareous Lestock soil occurs most often on locally dry upper slopes and knolls where runoff reduces the amount of water entering the soil. This generally results in a thinner soil with less organic matter than Lestock soils on mid- and lower slopes. It is a well-drained soil characterized by a dark-gray, usually calcareous A horizon, 10 to 20 cm thick, underlain by a thin, calcareous B horizon and a grayish, moderately calcareous C horizon. This soil is often affected by erosion but the extent of erosion is less than on the eroded Lestock soil.

Eroded Lestock - The eroded Lestock soil, as the name implies, is a Lestock soil whose topsoil has been partially or almost totally removed by erosion. It occurs on upper slopes and knolls and can be easily recognized in cultivated fields by its light-brown to grayish surface. It occurs most often in hummocky landscapes with moderate to steep slopes.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Lestock Soils

The best Lestock soils are good agricultural soils of capability class 2; a slight moisture deficit, imparted by the subhumid regional climate and a moderate water-holding

capacity, is their main limitation. However, Lestock soils are often downrated based on other soil and landscape limitations (i.e. topography, erosion, stones, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Most Lestock soils have a moderate amount of organic matter in the A horizon, resulting in reasonably fertile soils of good tilth. Where Lestock soils occur on landscapes with gentle to moderate slopes, they have a low susceptibility to wind and water erosion. However, these soils frequently occur on landscapes with moderate to strong slopes; consequently, they often have a high to very high susceptibility to water erosion. The eroded Lestock soils on steep knolls have low nutrient reserves and are locally dry because of the rapid runoff associated with these slopes. Where Lestock soils have undergone severe erosion or where they are very susceptible to erosion, it is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, grassing runways, cultivating across slopes, and establishment of forages, be utilized to control soil erosion. It is very difficult to farm landscapes with strong to steep slopes and often the only way to effectively control erosion is to have a root system permanently in place, such as through standing stubble or forages. Lestock soils range from slightly to exceedingly stony, hence the number of annual clearing operations will vary considerably.

MEOTA (Me) SOILS

Meota soils are Black soils that have formed in sandy fluvial materials. Surface textures range from very fine sandy loam to loamy sand.

Meota soils are usually stone free, however, some stones may occur where the sandy deposits are shallow (less than 1 m thick) and underlain by glacial till or gravel. Meota soils frequently occur on undulating landscapes with very gentle to gentle slopes, but in some areas, these soils commonly occur on hummocky landscapes with gentle to moderate slopes.

Meota soils frequently occur in complex with soils of other associations. In most of these complexes, the Meota soils tend to occupy the mid- and lower slope positions. However, in complex with thick sandy soils or some of the Dark Gray soils, the Meota soils often occur on upper slope positions. In other complexes, the Meota soils may occur randomly throughout the landscape.

Kinds of Meota Soils

Orthic Meota - The orthic Meota soil usually occupies mid- and upper slope positions in most Meota landscapes. It is a well- to rapidly drained soil characterized by a black A horizon, 11 to 17 cm thick, underlain by a brownish B horizon and a light-brown, weakly calcareous C horizon.

Calcareous Meota - The calcareous Meota soil occurs on locally dry upper slopes and knolls where runoff reduces

the amount of water entering the soil. This results in a thinner soil with less organic matter than the surrounding Meota soils. It is characterized by a thin, often calcareous A horizon and usually a thin, calcareous B horizon. These soils are often subject to erosion and are frequently slightly lighter in color than the soils on mid- and lower slopes.

Eroded Meota - The eroded Meota soil, as the name implies, is a Meota soil whose topsoil has been partially or totally removed by wind erosion. It occurs most often on upper slopes and knolls, but can occur almost anywhere in the landscape. It can be easily recognized in cultivated fields by its light-brown surface color, as compared to the darker-colored Meota soils on mid- and lower slopes.

Agricultural Properties of Meota Soils

The best Meota soils, those with very fine sandy loam surface textures, are good agricultural soils of capability class 2; a moderate moisture deficit, imparted by the sub-humid regional climate and a moderate water-holding capacity, is their main limitation. Most Meota soils, however, have fine sandy loam to sandy loam surface textures, and are only fair agricultural soils of capability class 3; a low water-holding capacity is their main limitation. Meota soils with coarser textures (loamy sands) have an even lower water-holding capacity and are more droughty. These soils are considered to be poor agricultural soils of capability class 4. Meota soils may be further downrated based on other soil and landscape limitations (i.e. salinity, topography, wetness, etc.) that are peculiar to individual delineations. For example, Meota soils that have been severely eroded may be rated as capability class 4 or 5, depending on the severity of the erosion and its effect on crop production. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

The moderate organic matter content of these soils, coupled with their sandy textures, results in soils of low fertility that are not easily kept in good tilth. The potential for wind erosion is high on most Meota soils due to their sandy nature and weak structure, which makes it difficult to keep a rough surface that is resistant to wind erosion. Management practices that maintain a trash cover and maintain or increase the organic matter content of these soils are recommended. Such practices include reduction of tillage, leaving stubble standing, frequent inclusion of forages in crop rotations and addition of manure. Water erosion is generally not a problem because of their high infiltration rates. Likewise, stones are seldom a problem on these soils.

MEADOW (Mw) SOILS

Meadow soils are Poorly Drained soils that have formed in variable-textured alluvial sediments typically associated with low-lying depressional basins. Surface textures are variable but usually range from loam to clay.

Meadow soils are usually stone free, although some stones may occur where the alluvial materials are shallow (less than 1 m thick) and underlain by glacial till. Meadow

soils usually occur on nearly level to very gently sloping landscapes.

Meadow soils may occur in complex with soils of other associations. If they are in complex with organic soils, they usually occur on upper slope positions or along the margins of the organic deposit. Occasionally, Meadow soils may occur in complex with well-drained soils. In these cases, the Meadow soils occur in lower landscape positions.

Kinds of Meadow Soils

Poorly Drained Meadow - The poorly drained Meadow soils occur in depressional areas that are subject to flooding. They are wet for all or a significant portion of the growing season. They may have a relatively thick, dark-colored A horizon and drab-colored B and C horizons that are dotted with reddish spots and streaks. In some cases, the poorly drained soils are also saline. In these areas, soluble salts are usually present within 50 cm of the surface.

Agricultural Properties of Meadow Soils

Meadow soils are fair to nonarable agricultural soils of capability classes 3 to 6. The wide range in agricultural capability is mainly a result of varying degrees of wetness and salinity. Many of these soils are wet for all or a significant portion of the growing season, thus limiting their use for arable agriculture. Improved drainage, however, has permitted cultivation in some areas and may result in fair agricultural soils. While textures vary, they usually range from loam to clay; consequently, water-holding capacity is often adequate. The organic matter content of the surface horizon is usually high, resulting in reasonable fertility and good tilth. Stones are rarely a problem in Meadow soils. Because of the association of these soils with lower portions of the landscape, wind erosion is not a serious problem. On the other hand, they do receive runoff water in the spring or during periods of intense rainfall and, consequently, are susceptible to water erosion and to flooding. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

NAICAM (Nc) SOILS

Naicam soils are Thick Black soils that have formed in shallow (less than 1 m thick), moderately to highly calcareous, silty lacustrine materials underlain by glacial till. These soils have a surface horizon greater than 20 cm thick. Surface textures are predominantly loam to clay loam but can range to silt loam and silty clay loam.

Naicam soils are typically slightly stony to stone free, but may be moderately stony in areas where the lacustrine materials are very shallow or where they occur in complex with glacial till or gravel. Naicam soils are usually associated with undulating or undulating dissected landscapes with very

gentle to gentle slopes, but also occur on hummocky landscapes with gentle to moderate slopes, particularly where they occur in complex with soils formed in glacial till.

Naicam soils frequently occur in complex with soils of other associations. In most of these complexes, the Naicam soils occur on the mid- and lower slope positions.

Kinds of Naicam Soils

Orthic Naicam - The orthic Naicam soil occupies mid- to lower slope positions. It is a well-drained soil characterized by a black A horizon, 20 to 32 cm thick, underlain by a distinct, brownish-colored, lime-free B horizon and a grayish-colored, moderately to strongly calcareous C horizon.

Calcareous Naicam - The calcareous Naicam soil occurs mainly on upper slopes and knolls but may also occur on mid- and lower slope positions. It is a well-drained soil characterized by a black, usually calcareous A horizon, 22 to 34 cm thick, underlain by a calcareous B horizon and a grayish-colored, moderately to strongly calcareous C horizon.

Carbonated Naicam - The carbonated Naicam soil occurs on mid- to lower slopes, frequently surrounding sloughs or poorly drained depressions, and in imperfectly to poorly drained depressional areas. It is an imperfectly drained soil characterized by a highly calcareous A horizon, 22 to 30 cm thick, underlain by a highly calcareous B or C horizon. The B and C horizons often have dull colors and reddish spots and stains, indicative of imperfect soil drainage. Streaks of carbonate frequently occur throughout the upper horizons.

Saline Naicam - The saline Naicam soil usually occurs on lower slopes and in imperfectly to poorly drained depressions or along shallow drainage channels, where the upward movement of subsurface water results in the deposition of salts in upper horizons. Consequently, soluble salts are usually present within 50 cm of the surface. The salts occur as a light-colored surface crust or as small, white specks in the soil, although salts may not always be visible. Dull colors and reddish spots and stains, indicative of imperfect soil drainage, are often present in the subsoil. These soils frequently occur in association with carbonated Naicam soils.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Naicam Soils

Naicam soils are very good agricultural soils with an agricultural capability rating of class 1. These soils may be downrated based on soil and landscape limitations (i.e. salinity, topography, stones, etc.) that are peculiar to individual delineations. They are often downrated to agricultural capability class 2 due to the accumulative effect of two or more adverse characteristics of the soil and landscape which singly, are not serious enough to affect the class rating. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Naicam soils are naturally fertile due to their thick surface horizon and high organic matter content. They are low in available phosphorus and high in available potassium. Crops grown on these soils will respond to additions of nitrogen and phosphorus fertilizers. Some soils may be highly alkaline, which may limit the yield of particular crops and the availability of some plant nutrients.

Stones are seldom a problem on most Naicam soils, however, due to the presence of glacial till near the surface, occasional clearing may be required. Similarly, water erosion is not a serious problem, but can become serious during periods of intense rainfall due to the relatively low infiltration rate of these soils. The potential for water erosion is greatest in areas with long slopes; management practices such as cultivation across slopes and grassing of runways should be followed as much as possible. Wind erosion may be a problem in Naicam soils unless conservation practices are followed. Such practices include continuous cropping and the maintenance of crop residues through reduced tillage or leaving stubble standing.

NISBET (Nt) SOILS

Nisbet soils are Dark Gray soils that have formed in sandy fluvial materials, in areas where wooded vegetation has had an influence on soil formation. Surface textures range from loamy sand to sandy loam.

Nisbet soils are usually stone free, however, some stones may occur where the sandy deposits are shallow (less than 1 m thick) and underlain by glacial till or gravel. These soils are typically associated with hummocky landscapes having gentle and moderate slopes. Undulating landscapes with very gentle to gentle slopes occur less frequently.

The Nisbet soils often occur in complex with soils of other associations. In most of these complexes, the Nisbet soils occur on mid- and upper slope positions. However, in complexes with soils developed in glacial till, the Nisbet soils usually occur on the mid- and lower slope positions.

Kinds of Nisbet Soils

Orthic Nisbet - The orthic Nisbet soil can occupy all slope positions in some landscapes. It is a well-drained soil

that is characterized by a dark-gray A horizon, 11 to 22 cm thick, underlain by a brown-colored, lime-free B horizon and a light-brown, weakly calcareous C horizon.

Agricultural Properties of Nisbet Soils

Nisbet soils with fine sandy loam and sandy loam surface textures are fair agricultural soils of capability class 3 due primarily to their sandy nature. The occurrence of these soils in an area of more favorable precipitation compensates slightly for the low water-holding capacity. The coarser-textured Nisbet soils, those with loamy sand and sand surface textures, are considered to be poor agricultural soils of capability class 4. Nisbet soils may be further downrated based on soil and landscape limitations (i.e. salinity, wetness, topography, erosion, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

The Nisbet soils have a low organic matter content which, combined with the sandy nature of this soil, results in one of the poorest agricultural soils in the Dark Gray soil zone. Fertilizer applications, particularly nitrogen and phosphorus, can increase their productivity somewhat. In addition, applications of potassium and sulphur may be required for certain crops. The potential for erosion is high on these soils because of their sandy texture, weak structure and low organic matter content, making it difficult to keep a cloddy surface that is resistant to wind erosion. It is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, frequent inclusion of forages in crop rotations, and shelterbelts, be utilized wherever possible to control soil erosion and maintain or enhance soil organic matter content and aggregate stability. Stones are generally not a problem. Areas of poorly drained soils, especially those with peaty surfaces, often have little potential for arable agriculture and are best suited for forage production or pasture.

OXBOW (Ox) SOILS

Oxbow soils are Black soils that have formed in loamy glacial till. Surface textures are predominantly loam but can range from sandy loam to clay loam.

Oxbow soils are usually slightly to moderately stony, but some areas are very stony. Oxbow soils can occur on a variety of landscapes, but most commonly occur on undulating landscapes with very gentle to moderate slopes and on hummocky landscapes with slopes ranging from gentle to moderate in some areas to steep in others.

Oxbow soils frequently occur in complex with soils of other associations. In most of these complexes, the Oxbow soils occur on the mid- and upper slopes, however, in complex with Dark Brown or Dark Gray soils, they may occur on lower slopes.

Kinds of Oxbow Soils

Orthic Oxbow - The orthic Oxbow soil occurs on mid-slopes in most Oxbow landscapes, however, it may extend onto upper and lower slope positions in landscapes with gentle slopes. It is a well-drained soil characterized by a black A horizon, 11 to 18 cm thick, underlain by a brownish B horizon and a grayish-colored, moderately calcareous C horizon.

Calcareous Oxbow - The calcareous Oxbow soil occurs on locally dry upper slopes and knolls where runoff reduces the amount of water entering the soil. This results in a thinner soil with less organic matter than the surrounding orthic Oxbow soils. It is characterized by a thin, usually calcareous A horizon, 10 to 16 cm thick, which is usually underlain by a thin, calcareous B horizon, overlying a grayish-colored, moderately calcareous C horizon.

Weakly Developed Oxbow - The weakly developed Oxbow soil occurs on locally dry upper slopes and knolls where runoff reduces the amount of water entering the soil. This results in a thinner soil with less organic matter than surrounding Oxbow soils. It is characterized by a black, usually calcareous A horizon, 9 to 17 cm thick, underlain by a grayish-colored, moderately calcareous C horizon. This soil is often affected by erosion but to a lesser extent than the eroded Oxbow soil.

Eroded Oxbow - The eroded Oxbow soil, as the name implies, is an Oxbow soil whose topsoil has been partially or almost totally removed by erosion. It occurs on knolls and upper slopes and can be easily recognized in cultivated fields by its light-brown to grayish surface. It occurs most often on hummocky landscapes with moderate to steep slopes and, in severely eroded areas, may occupy 30 percent or more of the landscape.

Carbonated Oxbow - The carbonated Oxbow soil occurs on lower slopes, frequently surrounding sloughs or poorly drained depressions. It is characterized by a highly calcareous A horizon underlain by a highly calcareous B or C horizon. The B and C horizons often have drab colors and reddish spots and stains, indicative of imperfect soil drainage. Streaks of carbonate may occur throughout most or all of the profile. Due to their position in the landscape, salts are often present in many carbonated Oxbow soils.

Saline Oxbow - The saline Oxbow soil occurs on lower slopes, often surrounding sloughs or poorly drained depressional areas, and along drainage channels or gullies. It is characterized by the presence of soluble salts, usually within 50 cm of the surface. The salts occur as a white surface crust or as small, white specks within the soil, although salts may not always be visible. Dull colors and reddish spots and stains, indicative of imperfect soil drainage, are often present in the subsoil. This soil frequently occurs intermixed with carbonated Oxbow soils on lower slopes surrounding sloughs.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and

low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Oxbow Soils

The best Oxbow soils are those with a clay loam surface texture. They are very good agricultural soils of capability class 1. The more common Oxbow soils, those with a loam surface texture, are good agricultural soils of capability class 2; a slight moisture deficit, imparted by the subhumid regional climate and a moderate water-holding capacity, is their main limitation. Oxbow soils with a sandy loam surface texture are fair agricultural soils of capability class 3. Oxbow soils are often downrated further based on other soil and landscape limitations (i.e. salinity, wetness, topography, stones, erosion, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Most Oxbow soils have a moderate amount of organic matter in the A horizon resulting in reasonably fertile soils of good tilth. These soils, however, are usually low in available phosphorus but high in available potassium. Crops grown on most Oxbow soils respond to additions of nitrogen and phosphorus fertilizers. Oxbow soils range from slightly to very stony, hence, the number of clearing operations required each year will vary considerably.

Oxbow soils occur on a variety of landscapes. Where they occur on landscapes with very gentle to moderate slopes, they have a low susceptibility to wind and water erosion. However, it is not unusual for these soils to occur on landscapes with strong to steep slopes (sometimes dissected), in which case they will have a high to very high susceptibility to water erosion. The eroded Oxbow soils on steep knolls and ridges have low nutrient reserves and are locally dry because of the rapid runoff associated with these slopes. Where Oxbow soils have undergone severe erosion or where they are very susceptible to erosion, it is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, grassing water runways, cultivation across slopes and establishment of forages, be utilized to control soil erosion.

include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

RUNWAY (Rw) SOILS

Runway soils are formed in various deposits associated with the sides and bottoms of shallow drainage channels. This group of soils range from weakly developed to poorly drained and are primarily associated with dissected landscapes. As a result, surface texture, degree of stoniness, slope class and salinity are extremely variable.

Agricultural Properties of Runway Soils

Runway soils are usually rated as class 4, 5 or 6 for agricultural capability. Most of these soils, however, are nonarable in that the bottom lands are poorly drained and the side slopes are often too steep to permit cultivation. A few areas, where slopes permit crossing with field implements, have some potential for cultivation. As well, many areas have little potential for grazing land because they occur as narrow strips cutting through cultivated areas. Where they are large enough to be fenced, they do have some value as pasture land depending upon steepness of slope, density of tree cover and availability of water. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

SONNINGDALE (Sd) SOILS

Sonningdale soils are Black soils that have formed in a complex mixture of sandy glaciofluvial and glaciolacustrine materials, loamy glacial till and sandy water-modified glacial till. Surface textures are predominantly loam, fine sandy loam and sandy loam but can range to loamy sand and gravelly sandy loam.

Sonningdale soils usually range from stone free to moderately stony, however, stoniness can be extremely variable. Sonningdale soils developed in the glaciofluvial and glaciolacustrine materials may be stone free, whereas those developed in the glacial tills can range from slightly stony to exceedingly stony. Sonningdale soils usually occur on hummocky landscapes with gentle to strong slopes.

Sonningdale soils occasionally occur in complex with soils of other associations. In most of these complexes, the Sonningdale soils tend to be distributed randomly throughout the landscape.

Kinds of Sonningdale Soils

Orthic Sonningdale - The orthic Sonningdale soil occurs on mid-and lower slope positions in most Sonningdale landscapes. It is a well- to rapidly drained soil characterized by a black A horizon, 11 to 19 cm thick, underlain by a brownish B horizon and a grayish, moderately calcareous C horizon.

Eroded Sonningdale - The eroded Sonningdale soil, as the name implies, is a Sonningdale soil whose topsoil has been partially or almost totally removed by erosion. It occurs on knolls and upper slopes and can be easily recognized in

cultivated fields by its light-brown to grayish-colored surface. It occurs most often in hummocky landscapes with gentle to strong slopes.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Sonningdale Soils

The best Sonningdale soils, those with loam and very fine sandy loam surface textures, are good agricultural soils of capability class 2; a slight moisture deficit, imparted by a moderate water-holding capacity and the subhumid regional climate, is their main limitation. Sonningdale soils with fine sandy loam to sandy loam surface textures are fair agricultural soils of capability class 3 due primarily to their low water-holding capacity; those with loamy sand surface textures are poor agricultural soils of capability class 4 due to an even lower water-holding capacity. Sonningdale soils may be further downrated based on other soil and landscape limitations (i.e. topography, erosion, stones, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Most Sonningdale soils have a low to moderate amount of organic matter in the A horizon. Sonningdale soils with sandy textures and low organic matter contents have a moderate to high susceptibility to wind erosion and a low susceptibility to water erosion. Those with loamy textures and a moderate organic matter content have reasonably good tilth and a low to moderate susceptibility to wind and water erosion. However, it is not unusual for these soils to occur on landscapes with strong slopes; consequently, these soils have a high to very high susceptibility to water erosion. The eroded Sonningdale soils on steep knolls have very low nutrient reserves and are locally dry because of the rapid runoff associated with these slopes. It is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, inclusions of forages in crop rotations and shelterbelts, be utilized wherever possible to control soil erosion and maintain or enhance soil organic matter content and aggregate stability. It is very difficult to farm landscapes with strong to steep slopes and often the only way to effectively control erosion is to have a root system permanently in place, such as through standing stubble or forages. Sonningdale soils range from stone free to exceedingly stony, hence, the number of clearing operations required will vary considerably.

SWIFT CREEK (Sf) SOILS

Swift Creek soils are Black soils that have formed in a complex mixture of sandy and gravelly glaciofluvial materials and stony, eroded glacial till associated with stream channels. Surface textures are variable, ranging from sandy loam and gravelly sandy loam to loam.

Swift Creek soils are the result of erosion by glacial meltwaters and are primarily associated with variably sloping, dissected landscapes. Stones are always present in these soils, with some areas being excessively stony.

Kinds of Swift Creek Soils

Orthic Swift Creek - The orthic Swift Creek soil occurs on midslopes in most Swift Creek landscapes, but may extend through the lows in some areas as well as onto upper slopes. It is a well-drained soil with a black A horizon of variable thickness due to extremes of erosion and deposition. The A horizon is underlain by a brown-colored B horizon which, in turn, is underlain by a light-colored, calcareous C horizon.

Calcareous Swift Creek - The calcareous Swift Creek soil occurs on upper slopes and knolls where runoff reduces the amount of water entering the soil, resulting in a thinner soil with less organic matter than the orthic Swift Creek soil. It has a thin, usually calcareous A horizon and may have a thin, calcareous B horizon. This soil is often affected by erosion, but to a lesser extent than the eroded Swift Creek soil.

Eroded Swift Creek - The eroded Swift Creek soil is a shallow soil whose topsoil has been partially or totally removed by erosion. It occurs on extreme knolls and upper slopes and can be easily recognized in a cultivated landscape by its light-brown to grayish surface color.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Swift Creek Soils

Swift Creek soils are fair to poor agricultural soils, primarily of capability classes 3 and 4. Their sandy surface textures, coupled with gravelly subsurface textures, result in a low water-holding capacity. The finer-textured Swift Creek soils (the loams to fine sandy loams) are rated as class 3 while the coarser-textured Swift Creek soils (the sandy loams to loamy sands) are rated as capability class 4 due

primarily to their lower water-holding capacity. These soils may be further downrated based on other soil and landscape limitations (i.e. salinity, topography, stones, excess wetness) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Their low to moderate organic matter content and sandy nature result in soils of moderate fertility that are not easily kept in good tilth. Most fields will require periodic clearing of stones and, in some instances, stones are a serious handicap to cultivation. These soils are susceptible to both wind and water erosion because of their sandy nature, weak structure and the dissected landscapes in which they occur. Where these soils are cultivated, it is recommended that soil conservation practices, such as maintenance of crop residues (through reduced tillage or leaving stubble standing), strip cropping and frequent inclusion of forages, be utilized to control soil erosion and maintain or enhance the organic matter content of the soil. Saline Swift Creek soils have sufficient salinity at or near the surface to depress crop yields in most years, whereas in the carbonated Swift Creek soils, salinity may be low near the surface but sufficiently high at depth to reduce yields in dry years. Poorly drained soils are usually wet for all or a sufficient portion of the growing season to restrict their agricultural use. Many have little or no value for agriculture, while others have only a limited potential as areas for forage production.

TIGER HILLS (Tg) SOILS

Tiger Hills soils are Dark Gray soils that have formed in shallow (less than 1 m thick), silty lacustrine materials underlain by glacial till, in areas of mixed grassland and forest, where wooded vegetation has had some influence on soil formation. Surface textures are predominantly loam and silt loam, but can range to silty clay loam and clay loam.

Tiger Hills soils are typically slightly stony to stone free, but may be moderately stony in areas where the lacustrine materials are very shallow or where they occur in complex with glacial till or gravel. They are usually associated with undulating or undulating dissected landscapes with very gentle to gentle slopes, but can also occur on more strongly sloping hummocky landscapes, particularly where they occur in complex with soils formed in glacial till.

Tiger Hills soils frequently occur in complex with soils of other associations. In most of these complexes, the Tiger Hills soils occur on the mid- and lower slope positions.

Kinds of Tiger Hills Soils

Orthic Tiger Hills - The orthic Tiger Hills soil may occupy all slope positions. It is a well-drained soil characterized by a dark-gray A horizon, 12 to 22 cm thick, underlain by a dark brownish-colored B horizon and a yellowish-brown, moderately calcareous C horizon.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and,

occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought.

Agricultural Properties of Tiger Hills Soils

Tiger Hills soils are generally good agricultural soils rated as agricultural capability class 2. A slight moisture deficit, imparted by a moderate water-holding capacity and the subhumid regional climate, is their main limitation. These soils may be further downrated based on other soil and landscape limitations (i.e. salinity, topography, stones, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Tiger Hills soils have a moderate amount of organic matter in the A horizon. They are low in available phosphorus and high in available potassium. Crops grown on these soils usually respond well to applications of nitrogen and phosphorus fertilizers.

Stones are seldom a problem on Tiger Hills soils, however, due to the presence of glacial till near the surface, a few stones may be present and occasional clearing may be required. Similarly, water erosion is not a serious problem, but can become serious during periods of intense rainfall due to the relatively low infiltration rate of these soils. The potential for water erosion is greatest in areas with long slopes and management practices, such as cultivation across slopes and grassing of runways, should be followed as much as possible. Wind erosion may be a problem, unless conservation practices are followed. Such practices include maintenance of crop residues through reduced tillage or leaving stubble standing, continuous cropping, or the establishment of forages in seriously affected areas.

WHITEWOOD (Wh) SOILS

Whitewood soils are Dark Gray soils that have formed in loamy glacial till, in areas of mixed grassland and forest, where wooded vegetation has had an influence on soil formation. Soils formed under these conditions are usually slightly leached, resulting in lower organic matter levels than similar soils occurring in the Black soil zone and, therefore, a dark gray-colored surface horizon. Surface textures are predominantly loam but may range from sandy loam to clay loam.

These soils are moderately to very stony. They usually occur on hummocky landscapes having gentle to moderate slopes, although steeper slopes are common in some areas.

Where Whitewood soils occur in complex with Black soils such as Oxbow, their occurrence in the landscape is a function of drainage and precipitation. In southern parts of

the Black soil zone, Whitewood soils tend to occur on the lower slopes, whereas, in the northern more humid parts of the zone, the Whitewood soils occur on the well-drained upper slopes. Whitewood soils also tend to occupy upper slope positions when they occur in complex with soils of the Gray soil zone. When Whitewood soils occur in complex with soils formed in lacustrine or fluvial materials, they usually occupy mid- to upper slope positions.

Kinds of Whitewood Soils

Orthic Whitewood - The orthic Whitewood soil occupies lower slopes in most Whitewood landscapes, but may extend to the midslope in some areas, and upper slopes and knolls in other areas. It is a well-drained soil with a dark-gray A horizon, 10 to 18 cm thick, underlain by a brownish or reddish-brown B horizon that usually has a moderate, angular blocky structure when dry, and is, in turn, underlain by a grayish-colored, moderately calcareous C horizon. There may be a thin, grayish layer with platy structure between the A and B horizons which, if cultivated, is often incorporated into the plow layer. This mixing imparts a dark-gray color to the soil surface.

Calcareous Whitewood - The calcareous Whitewood soil occurs on locally dry upper slopes and knolls where runoff reduces the amount of water entering the soil. This results in a thinner soil with less organic matter than the surrounding Whitewood soils. It has a thin, usually calcareous A horizon underlain by a thin, calcareous B horizon and a grayish-colored, moderately calcareous C horizon. This soil is often affected by erosion but the extent of erosion is less than on the eroded Whitewood soil.

Eroded Whitewood - The eroded Whitewood soil, as the name implies, is a Whitewood soil whose topsoil has been partially or almost totally removed by erosion. It occurs on upper slopes and knolls and is easily recognized by its lighter, grayish-colored A horizon. This A horizon is low in organic matter, is often calcareous and directly overlies the C horizon.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Whitewood Soils

Whitewood soils are good agricultural soils of capability class 2. The main agricultural limitation of these soils is a slight moisture deficit, imparted by the subhumid regional

climate and a moderate water-holding capacity. These soils may be further downrated based on other soil and landscape limitations (i.e. salinity, topography, stones, etc.) that are peculiar to an individual delineation. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

The degree of leaching that has occurred in these soils is important when evaluating their productivity. Those that are only slightly leached are nearly equal to similar soils developed in the Black soil zone, whereas the more strongly leached Whitewood soils are lower in organic matter and natural fertility and have poorer structure. Some of the more strongly leached soils may be susceptible to crusting after rains and the dense B horizon may restrict rooting.

Stones, in many cases, pose a hindrance to cultivation and regular clearing is often required. Wind erosion has not been a serious problem but can be expected to worsen when all the land is cleared and cultivated. Water erosion is generally not a serious problem, except on moderately or strongly sloping landscapes. Management practices that include forages in the crop rotations should be used to enhance soil organic matter content and improve soil structure.

WINDTHORST (Wn) SOILS

Windthorst soils are Black soils that have formed in sandy to loamy, water-modified glacial till. The water modification has resulted in an enrichment of the glacial till with sandy materials. Thus, the parent material consists of a range of materials including loamy glacial till, sandy glacial till and shallow, sandy glaciofluvial materials. Surface textures are predominantly loam and sandy loam but can range to gravelly sandy loam.

Windthorst soils are usually slightly to moderately stony and require only periodic clearing, but some areas are very stony, presenting a more serious handicap to cultivation. Windthorst soils usually occur on hummocky landscapes with gentle to moderate slopes, however, they also occur in areas with gentle to very gently sloping undulating landscapes and areas with strongly sloping hummocky landscapes.

Windthorst soils occasionally occur in complex with soils of other associations. In these complexes, the Windthorst soils are usually distributed randomly throughout the landscape.

Kinds of Windthorst Soils

Orthic Windthorst - The orthic Windthorst soil occurs on midslopes in most Windthorst landscapes, however, it may extend onto upper and lower slope positions in some areas. It is a well-drained soil with a black A horizon, 10 to 20 cm thick, underlain by a brownish B horizon and a grayish-colored moderately, calcareous C horizon.

Calcareous Windthorst - The calcareous Windthorst soil occurs on locally dry upper slopes and knolls where

runoff reduces the amount of water entering the soil. The soil is thinner, with less organic matter than Windthorst soils occurring on mid- and lower slopes. It has a thin, usually calcareous A horizon, and a thin, calcareous B horizon overlying a grayish-colored, moderately calcareous C horizon.

Eroded Windthorst - The eroded Windthorst soil, as the name implies, is a Windthorst soil whose topsoil has been partially or almost totally removed by erosion. It occurs on upper slopes and knolls and is easily recognized in cultivated fields by its light-brown to grayish surface color. It occurs most often in hummocky landscapes with moderate to steep slopes and, in severely eroded areas, may occupy 30 percent or more of the landscape.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Windthorst Soils

The best Windthorst soils are those with a loam or sandy loam surface texture. These are fair agricultural soils of capability class 3. A moderate water-holding capacity is their main limitation. Windthorst soils with a lighter surface texture (loamy sand or gravelly loamy sand), and consequently a lower water-holding capacity, are considered to be poor agricultural soils of capability class 4. Windthorst soils may be further downrated based on other soil and landscape limitations (i.e. salinity, wetness, topography, stones, erosion, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

The low to moderate organic matter content and sandy nature of Windthorst soils result in soils of moderate fertility that are not easily kept in good tilth. Nutrient reserves, particularly reserves of phosphorus, are low in these soils. Various amounts of stones occur throughout the landscape and periodic clearing is required. The potential for wind erosion is fairly high on these soils because of their sandy texture and weak structure, which make it difficult to keep a rough surface that is resistant to wind erosion. Water erosion is generally not a serious problem (due to high infiltration rates) except on steeply sloping lands or in areas with long slopes. It is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, strip cropping, grassing runways, cultivation across slopes and establishment of forages, be utilized to control soil erosion.

WHITESAND (W_s) SOILS

Whitesand soils are Black soils that have formed in gravelly fluvial materials. Surface textures usually range from loamy sand to sandy loam or loam, however, in some areas, gravelly phases of these textures may be more common.

Stoniness is variable, ranging from nonstony in some areas to moderately stony in others. Whitesand soils are usually associated with undulating landscapes having very gentle to gentle slopes and hummocky landscapes with gentle to moderate slopes.

Whitesand soils occur in complex with soils of many other associations. In most of these complexes, the Whitesand soils can occur in any slope position.

Kinds of Whitesand Soils

Orthic Whitesand - The orthic Whitesand soil usually occurs on mid- and lower slope positions but may extend onto upper slopes and knolls in some landscapes. It is a rapidly drained soil with a black A horizon, 10 to 20 cm thick, underlain by a brownish B horizon and a lighter-colored, weakly calcareous C horizon. The C horizon is often much more gravelly than either the A or B horizon.

Calcareous Whitesand - The calcareous Whitesand soil usually occurs on upper slopes and knolls. It is a rapidly drained soil characterized by a thin, usually calcareous A horizon and, usually, a thin, calcareous B horizon. These soils are often subject to erosion and are frequently lighter in color than the surrounding soils on mid- and lower slopes.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Whitesand Soils

Whitesand soils are fair to poor agricultural soils of capability classes 3 and 4. Their sandy surface textures, coupled with gravelly subsurface textures, result in very low to low water-holding capacities. The finer-textured Whitesand soils, the loams to fine sandy loams, are rated as class 3, while the coarser-textured Whitesand soils, the sandy loams to loamy sands, are rated as capability class 4 due primarily to their lower water-holding capacity. These soils may be further downrated based on other soil and landscape limitations (i.e. salinity, topography, stones, etc.) that are peculiar to individual delineations. For example, exceedingly stony

Whitesand soils, which cannot be cultivated unless considerable clearing is done, are rated as capability class 5. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

The low to moderate organic matter content and low inherent fertility of Whitesand soils contribute to the low potential that these soils have for the production of annual crops. Whitesand soils are also highly susceptible to wind erosion. Their sandy textures and weak structure make it difficult to maintain a cloddy surface that is resistant to wind erosion. Where these soils are cultivated, it is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, strip cropping and frequent inclusion of forages, be utilized to control soil erosion and maintain or enhance the organic matter content of the soil. Water erosion is not a problem on most of these soils because of their high infiltration rate. Stoniness varies from one area to another and even within the same area of Whitesand soils. Some areas are stone free while others have sufficient stones to require periodic removal if the soils are to be cultivated. At best, these soils are marginal for arable crops, with many areas best utilized for forage production or native grazing.

WAITVILLE (W_v) SOILS

Waitville soils are Gray soils that have formed in loamy glacial till, in areas where wooded vegetation has had a strong influence on soil formation. Soils formed under these conditions are highly leached, resulting in lower organic matter levels and, hence, dark-gray to gray surface colors. Surface textures range from loam to sandy loam.

Waitville soils are typically slightly to moderately stony but range to exceedingly stony in some areas. They usually occur on hummocky landscapes with slopes ranging from gentle to steep.

In most complexes in the Gray soil zone, the Waitville soils tend to occur on the mid- and upper slope positions, however, when these soils occur in complexes in the Black soil zone, the Waitville soils usually occur on the more moist and strongly leached lower slopes.

Kinds of Waitville Soils

Gray Wooded Waitville - The gray wooded Waitville soil usually occupies upper slope positions, however, it may extend to all slope positions in some landscapes. It is a well-drained soil which, under forested conditions, is characterized by the presence of a very thin, dark-colored surface horizon below the forest litter, underlain by a gray to grayish-brown, strongly leached horizon with platy structure. Upon cultivation, part or all of this leached horizon is incorporated into the plow layer, producing a light-gray surface. Below these horizons is a relatively thick, dark-brown to dark grayish-brown B horizon that usually has a strong (hard), angular blocky to prismatic structure due to an accumulation

of clay leached from upper horizons. The B horizon, in turn, is underlain by a grayish-colored, moderately calcareous C horizon.

Dark Gray Wooded Waitville - The dark gray wooded Waitville soil occurs on mid- to lower slope positions. It is a well- to moderately well-drained soil which, under forested conditions, is characterized by the presence of a thin, dark-colored surface horizon below the forest litter, underlain by a gray to grayish-brown, leached horizon with platy structure. Upon cultivation, part or all of this leached horizon is incorporated into the plow layer, producing a dark-gray surface. Below these horizons is a relatively thick, dark-brown to dark grayish-brown B horizon that usually has a strong (hard), angular blocky to prismatic structure due to an enrichment of clay leached from upper horizons. The B horizon is underlain, in turn, by a grayish-colored, moderately calcareous C horizon.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought.

Agricultural Properties of Waitville Soils

Waitville soils are fair agricultural soils of capability class 3. They have a slight moisture deficit due to the regional subhumid climate and a moderate water-holding capacity. The main limitations of these soils are related to soil structure. The low organic matter content of some of these soils results in a structure that makes seedbed preparation difficult and also makes the soil susceptible to crusting after heavy rains, resulting in poor seedling emergence especially for small-seeded crops. They have a dense B horizon that may restrict water infiltration and root penetration. These limitations are most strongly expressed in the gray wooded soils. These soils may be further downrated based on other soil and landscape limitations (i.e. salinity, topography, stones, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Waitville soils are low in available phosphorus and high in available potassium. They are moderately acid to neutral in reaction, however, the acidity does not usually affect the yield of cereal crops. However, there may be local areas with moderate acidity where the growth of some sensitive crops, such as alfalfa, may be inhibited.

Stones can pose a serious hindrance to cultivation and annual clearing is often required. Water erosion is not a serious problem, but can be during periods of intense rainfall due to the relatively low infiltration rate of these soils. Management practices, such as cultivation across slopes and grassing of runways in affected areas, should be followed as

much as possible. Wind erosion can be a problem unless conservation practices are followed. Such practices include maintenance of crop residues through reduced tillage or leaving stubble standing, strip cropping or the establishment of forages in seriously-affected areas. The use of legumes in crop rotations will help to increase the soil organic matter content and, thus, improve the surface structure of these soils.

WETLAND (Wz) SOILS

Wetland soils are Poorly Drained soils formed in a mixture of materials associated with depressional areas. Most occur as sloughs, too small to show separately on the soil map, and are included in the map units of the surrounding upland soils. Only the larger areas have been delineated on the map. The Wetland soils are made up of a variety of soils which are referred to collectively as poorly drained soils. All are wet for at least a portion of the growing season and many remain flooded for much or all of the growing season.

Kinds of Wetland Soils

Poorly Drained Wetland - Poorly drained Wetland soils occur in sloughs and, occasionally, in the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. The A horizon may be thin or thick (greater than 10 cm), and darkly colored; or it may be leached and gray or grayish-brown in color. Peaty poorly drained soils have a layer of peaty material, from 15 to 40 cm thick, overlying mineral materials. Wetland soils have drab subsurface colors that are often dotted with reddish spots and streaks. Some of these poorly drained soils are also saline and carbonated. Most of the poorly drained Wetland soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought.

Agricultural Properties of Wetland Soils

All areas of Wetland soils have little or no potential for arable agriculture. Most have an agricultural capability rating of class 5 or lower. Some areas are suitable for tame or native forage production or as native grazing land. Those areas indicated on the soil map with the symbol Wz1 have the highest potential. These are areas that usually become dry at some point in the growing season and have potential for forage production. Some of the shallower ones may be arable during extended dry periods and will have some potential for the production of tame hay, or early maturing, moisture-tolerant crops. Those areas indicated on the soil map with the symbol Wz2 usually have at least central portions remaining flooded for all of the growing season. In these areas, only the outer margins have any potential for the production of native hay. Those areas indicated on the soil map with the symbol Wz3 usually remain flooded for all of the growing season and have little or no potential for agricultural use, even as grazing land.

YORKTON (Yk) SOILS

Yorkton soils are Thick Black soils that have formed in highly calcareous, loamy glacial till, in more humid areas of the Black soil zone, where soils with thicker-than-normal surface horizons have formed. They are distinguished from Oxbow soils by having a surface horizon that is greater than 20 cm in thickness. Surface textures are predominantly loam and clay loam but can range from sandy loam to silty clay loam.

Yorkton soils are usually slightly to very stony and are commonly associated with hummocky landscapes with slopes ranging from gentle to moderate although undulating landscapes with very gentle slopes are common in some areas.

The Yorkton soils occur in complex with many other soil associations. In complexes with other soils formed in glacial till, they usually occur on the mid- to lower slopes, however, when in complex with soils formed in lacustrine or fluvial materials, they often occur on the mid- to upper slope positions.

Kinds of Yorkton Soils

Orthic Yorkton - The orthic Yorkton soil occurs mainly on lower slopes but may extend onto mid- and upper slopes in some landscapes. It is a well- to moderately well-drained soil with a black A horizon that is 20 to 33 cm thick. It is underlain, in turn, by a brownish B horizon and a grayish-colored, strongly calcareous C horizon.

Calcareous Yorkton - The calcareous Yorkton soil occurs mainly on well-drained upper slopes but can also occur on some moderately well-drained lower slopes. The black A horizon is usually calcareous and is 21 to 33 cm thick. It is usually underlain by a brownish to grayish-brown, calcareous B horizon and a grayish-colored, strongly calcareous C horizon.

Carbonated Yorkton - The carbonated Yorkton soil occurs mainly on lower slopes, frequently surrounding sloughs or poorly drained depressions, but may also occur on imperfectly drained, nearly level or very gently sloping areas. The black-colored A horizon is highly calcareous and is usually thicker than the A horizon of the Yorkton soils on mid- and upper slopes. The underlying B horizon, if present, and the C horizon are highly calcareous and often have drab colors and reddish spots and stains, indicative of imperfect soil drainage. In some areas, these soils are affected to some degree by salinity.

Saline Yorkton - Saline Yorkton soils occur on lower slopes and in imperfectly drained depressions where the upward movement of subsurface water results in the deposi-

tion of salts in upper horizons. Consequently, soluble salts are usually present within 50 cm of the surface. The salts occur as a white surface crust, or as small, white specks within the soil, although salts may not always be visible. Dull colors and reddish spots and stains, indicative of imperfect soil drainage, are often present in the subsoil. It frequently occurs intermixed with the carbonated Yorkton soil.

Poorly Drained Soils - Poorly drained soils represent a variety of wet soils. They occur mainly in sloughs and, occasionally, on the bottom of small drainage channels and low-lying depressional areas. They occur in areas that collect runoff from heavy rains and snowmelt, and usually remain wet for much of the growing season. They often have thick, dark-colored A horizons and drab subsurface colors that include reddish spots and streaks. Most of these soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

Agricultural Properties of Yorkton Soils

The best Yorkton soils, those with loam and clay loam surface textures, are very good agricultural soils of capability class 1. The less common sandy loam-textured Yorkton soil has a capability rating of class 2 and is considered to be a good agricultural soil. A slight moisture deficit, imparted by a moderate water-holding capacity and the subhumid regional climate, is their main limitation to the production of common field crops. These soils may be further downrated based on other soil and landscape limitations (i.e. salinity, topography, stones, etc.) that are peculiar to individual delineations. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Yorkton soils are naturally fertile. They have a moderately high organic matter content and are reasonably easy to keep in good tilth. Most fields require periodic clearing of stones but the stones are generally not a serious problem. Wind erosion has not been serious but may have occurred to some extent on some knolls. Water erosion is generally not a problem except on sloping lands, particularly in areas with long slopes. Soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, grassing runways, cultivation across slopes and establishment of forages, may be used to control soil erosion. Saline soils occur infrequently, however, where they do occur, they are usually associated with depressional areas. Consequently, crop yields in areas adjacent to poorly drained depressions may be depressed in some years.

4. SOIL INTERPRETATIONS

4.1 SALINITY

Saline soils occur sporadically throughout the agricultural area of Saskatchewan. These soils contain sufficient water soluble salts to inhibit the uptake of moisture by plants, resulting in moisture stress and reduced plant growth. The presence of saline soils can often be recognized by bare spots in the crop or by uneven stands of grain or forage. Very strongly saline soils usually develop a white surface crust during dry weather. Where less salt is present, the soil is grayish in color when dry and the subsoil often has streaks or specks of salt at a depth of 5 to 25 cm or deeper. In weakly saline or moderately saline soils that are very wet, it may not be possible to see the salt.

Development of Saline Soils

Saline soils result almost invariably from the movement of salts carried by groundwater and subsequent concentration in the soil upon evaporation of this water at or near the soil surface.

Soluble salts are present in the parent materials of all soils as the result of on-going natural, chemical and physical weathering processes. When the amount of water evaporating from the soil is greater than the amount infiltrating, salts may accumulate in the soil and may result in saline soils. Areas are subject to soil salinization where water tables are high and the amount of infiltration of precipitation is limited. In most cases, this is a natural process which has been going on since the time of deglaciation. Agriculture has, however, aggravated the problem in some areas by the use of cropping systems that are not as water efficient as the natural prairie.

Management of Saline Soils

Management of saline soils requires the effective management of soil water in both the saline and nonsaline parts of the landscape. In terms of water management for soil salinity control this means making the most efficient use of soil moisture possible. Extending the cropping rotation or continuously cropping in nonsaline areas will cycle more precipitation through crops rather than allowing it to reach the water table where it may contribute to salinity in some other location. Leaving stubble standing promotes a more even distribution of snow cover reducing the amount that blows off the land into large snow drifts or depressions where, upon melting, it has a greater chance of infiltrating to the watertable. Saline soils should be seeded to long-term forage or continuously cropped with crops having the ap-

propriate degree of salt tolerance. The objective in the saline areas is to reduce the amount of evaporation from the soil surface, lower the watertable level and move salts downward with infiltrating precipitation.

Table 2. The relative tolerance of common field crops to soil salinity. (Differences of one or two places in the ranking may not be significant.)

Degree of Salinity Tolerated					
	Nonsaline	Moderately Saline	Strongly to Very Strongly Saline		
Annual Field Crops					
Increasing Tolerance ↓	Soybeans	Canola	Barley may produce some crop but this land best suited to tolerant forages.		
	Field Beans	Mustard			
	Faba Beans	Wheat			
	Peas	Flax			
	Corn	Fall Rye ^a			
	Sunflowers	Oats			
		Barley ^a			
		Sugar Beets			
	Forage Crops				
	Increasing Tolerance ↓	Red Clover		Reed Canary	Altai Wild Rye
Alsike		Meadow Fescue	Russian Wild Rye		
Timothy		Intermediate Wheat	Slender Wheatgrass ^a		
		Crested Wheat	Tall Wheatgrass ^b		
		Brome			
		Alfalfa			
		Sweetclover ^a			

^a These crops not tolerant of flooding, which is common in some saline areas.

^b Under dry conditions slender wheatgrass is more tolerant than tall wheatgrass.

For more information on saline soils and their management, see the publication **The Nature and Management of Salt Affected Land in Saskatchewan** by Saskatchewan Agriculture, Soils and Crops Branch.

Explanation of the Salinity Symbol

The soil salinity symbol is made up of three components indicating the extent of saline soils, the degree of the salts in the saline soils, and the position in the landscape occupied by the saline soils within the delineation and is based on field observation alone.

Example: 1WPA	1 - Extent Class
	W - Degree Class
	PA - Landscape Position

Soil Salinity Extent Class Limits

Table 3. Soil salinity extent class limits.

Extent Class	% Of Area Affected
0	0
1	0 - 3
2	3 - 10
3	10 - 20
4	20 - 40
5	40 - 70
6	> 70

Soil Salinity Degree

Table 4. Description of soil salinity degree classes.

Salinity Degree	Electrical Conductivity of 0-60 cm depth (mS/cm)	Effect on Crop Growth and Estimate of Potential Yield Loss
Nonsaline	0 - 2	There are no visible effects of salts on the growth of crops. No yield loss.
(W) Weak	2 - 4	Yields of very sensitive crops may be restricted. Cereals are generally unaffected.
(M) Moderate	4 - 8	Yields of many crops are restricted. Wheat yields may be reduced by 30%.
(S) Strong	8 - 16	Only tolerant crops yield satisfactorily. Wheat yields may be reduced by 60%.
(V) Very Strong	16+	Only a few very tolerant crops yield satisfactorily. Wheat yields may be reduced by 80-100%.

Note: Electrical conductivity values based on a saturated paste extract.
Yield loss estimates are based on recent research and only apply to the saline soils, not to the entire delineated area.

Landscape Position

The landscape position describes where in the landscape saline soils occur. In some areas, saline soils occur in more than one landscape position. These situations are indicated by the use of two letters.

Table 5. Description of landscape position symbol.

Symbol	Description
P	Saline soils occur on the edges of depressions, sloughs or runways. All soils in the bottoms of the depressions are leached and nonsaline.
A	Saline soils occur throughout the bottoms of depressions and sloughs.
D	Saline soils extend throughout the bottoms of dissections and small runways.
S	Saline soils occur on the sides of hills and slopes well above any slough or depression.
I	Saline soil parent materials within 60 cm of the soil surface generally occur on knolls and upper slopes.

4.2 IRRIGATION SUITABILITY

The irrigation suitability rating is based on soil and landscape characteristics. The suitability rating uses limiting factors to predict the potential landscape-water-crop interaction. It also considers the potential long-term consequences of irrigation such that the soil will remain permanently productive while being irrigated. It does not consider water availability and quality, climate, or economics. Within any one map delineation there may be smaller soil areas that have a higher or lower irrigation suitability than that indicated by the map symbol. **Any decision regarding irrigation should be made only after a field-specific examination is made.**

Symbol Interpretation

The combination of soil and landscape categories (Table 6), based upon the most limiting features present (Tables 7 and 8), determine the irrigation class and suitability rating (Table 9).

A maximum of three limitations are shown in the symbol. An ideal soil area to be used for irrigation will have the following characteristics:

- medium texture
- uniform texture vertically and horizontally
- uniformly well drained
- nonsaline
- permeable
- nearly level
- nonstony

Table 6. Soil and landscape categories.

Soil Category	Landscape Category	Description
1	A	nonlimiting
2	B	slightly limiting
3	C	moderately limiting
4	D	severely limiting

Irrigation Symbol	
example: 2Cmvt ₁	
2C	- Irrigation class
m	- Soil limitations
v, t ₁	- Landscape limitations

The example above indicates that the area in question has slight limitations (2) due to soil factors (m) and moderate limitations (C) due to landscape factors (v, t₁). This area, therefore, has a fair suitability rating (Table 9).

Symbol Evaluation

Excellent to good areas (Table 9) can usually be considered irrigable. Fair areas are marginally suitable for irrigation providing adequate management exists such that the soil and adjacent areas are not affected adversely by water application. Poor soils can usually be considered nonirrigable. The rating is given for the area based on soil characteristics in the upper 1.2 m and the main landscape features in the area. Depending on the type and severity of the limitation, it may be advisable to investigate an area further. Portions of the total area may also be significantly better or poorer than the general rating would indicate. For example, within a poor area with steep slopes, there may be areas of gentler topography that may be suitable for small scale irrigation if the detailed examination indicates that this smaller area is otherwise suitable.

Decision to Irrigate

The cost of irrigation development can be expected to increase with less suitable soils. The suitability rating does not take into account important factors such as climate, agronomy, availability of water, or economics in determining the feasibility of an irrigation project. If a field is indicated to be suitable for irrigation based on the information presented in this report, then an onsite inspection should be made. Other factors not used in this rating should also be considered during a site specific examination. These include geological uniformity to 3 m, local relief, depth to bedrock, drainability, sodicity, organic matter content and surface crusting potential. These factors may affect the suitability to some degree in terms of the type of irrigation system that can be used, the type and amount of surface preparation needed, the response of the soil and crop to applied water, and the type of management needed. A decision can then be made whether to irrigate if economic conditions are suitable and an adequate source of water is available.

Irrigation can lead to improved stability and flexibility in farm production through improved reliability of water application. Although maximum yields may be attainable only through irrigation, assuming adequate management, other climatic considerations may affect the feasibility. Climatic factors may limit the range of crops that can be grown due to heat or growing season limitations. In higher rainfall areas of the province, irrigation water may only be, in many years, a minor supplemental source of water that may not be needed every year. In these cases, the increased returns through higher yields, in some years, may not justify the expense of development. In dry regions where the risk of crop failure due to drought is relatively high and the range of crops that can be grown is lower, irrigation water may be a potentially important source of moisture needed for crop growth.

Table 7. Landscape limitations.

Symbol	Description
a	Impact on Target Areas - refers to the hazard resulting from the impact of applied irrigation water to the irrigated area. Impacts may include such effects as higher water tables, wetter soils, and increases in soil salinity.
c	Impact on Nontarget Areas - refers to the hazard resulting from the impact of applied irrigation water on an adjacent nonirrigated area. The hazards may include such effects as higher water tables, wetter soils, development or build-up of saline areas, or flooding and sedimentation caused by runoff.
i	Inundation - refers to the frequency of flooding. The inundation hazard is used mainly on areas adjacent to rivers.
p	Stones - refers to the amount of stone present on the surface and in the soil. Stones may reduce the available water-holding capacity of the soil, increase development costs and restrict the types of crops that may be grown.
t	Slope - refers to the presence of simple slopes (t_1) in undulating landscapes, or complex slopes (t_2) in hummocky or inclined landscapes. Complex slopes are often more limiting than simple slopes. Topography may affect the type of irrigation system, design and management required.
v	Horizontal Variability - refers to the horizontal variations caused by texture, soil structure, and landscape pattern that may result in the surface ponding of irrigated soils.

Table 8. Soil limitations.

Symbol	Description
d	Structure - soil structural properties that restrict root and water penetration. Commonly used with soils that have a dense B horizon and an A horizon that is subject to crusting.
g	Geological Uniformity - the uniformity of the soil texture with depth. The greater the textural difference between the surface and subsoil, the greater the potential for the development of perched water tables and lateral water movement.
k	Hydraulic Conductivity - the rate at which water moves through a saturated soil. Used mainly on soil areas that swell upon wetting, restricting water movement through the soil.
m	Available Water-Holding Capacity - the amount of water held by a soil that can be absorbed by plants. Coarse-textured soils with a low water-holding capacity are considered to be relatively inefficient for irrigation, as compared to medium-textured soils. Soils with this limitation also have relatively high hydraulic conductivities and intake rates.
q	Intake Rate - the rate of movement of water into the soil. It is closely associated with hydraulic conductivity which controls the rate at which water moves through the soil, and thus affects the rate at which water is able to enter the soil. Usually used on fine-textured soils that have relatively low intake rates requiring relatively light water application rates.
r	Depth to Bedrock - the presence of near-surface bedrock. Perched water tables may form, resulting in poor drainage and lateral movement of water and salts.
s	Salinity - the presence of soluble salts that may affect the growth of crops. The potential exists for lower yields, or for lateral salt movement into adjacent areas.
w	Drainage - the rate of removal of water from a soil in relation to supply. Indicates areas of mainly poorly drained soils.

Table 9. Irrigation suitability classes.

Class	Rating	Degree of Limitation	Description
1A	Excellent	No soil or landscape limitations	These soils are medium textured, well drained and hold adequate available moisture. Topography is level to nearly level. Gravity irrigation methods may be feasible.
2A 2B 1B	Good	Slight soil and/or landscape limitations	The range of crops that can be grown may be limited. As well, higher development inputs and management skills are required. Sprinkler irrigation is usually the only feasible method of water application.
3A 3B 3C 1C 2C	Fair	Moderate soil and/or landscape limitations	Limitations reduce the range of crops that may be grown and increase development and improvement costs. Management may include special conservation techniques to minimize soil erosion, limit salt movement, limit water table build-up or flooding of depressional areas. Sprinkler irrigation is usually the only feasible method of water application.
4A 4B 4C 4D 1D 2D 3D	Poor	Severe soil and/or landscape limitations	Limitations generally result in a soil that is unsuitable for sustained irrigation. Some lands may have limited potential when special crops, irrigation systems, and soil and water conservation techniques are used.

4.3 STONES

The stones rating is an estimation of the average severity of stoniness in a delineation. The estimation is based on the amount of stone clearing activity required and is related to the number and size of stones on the soil surface, number and size

of stone piles, and the soil parent material observed. The amount of stone clearing activity required is categorized into one of six stone severity classes listed in the table below.

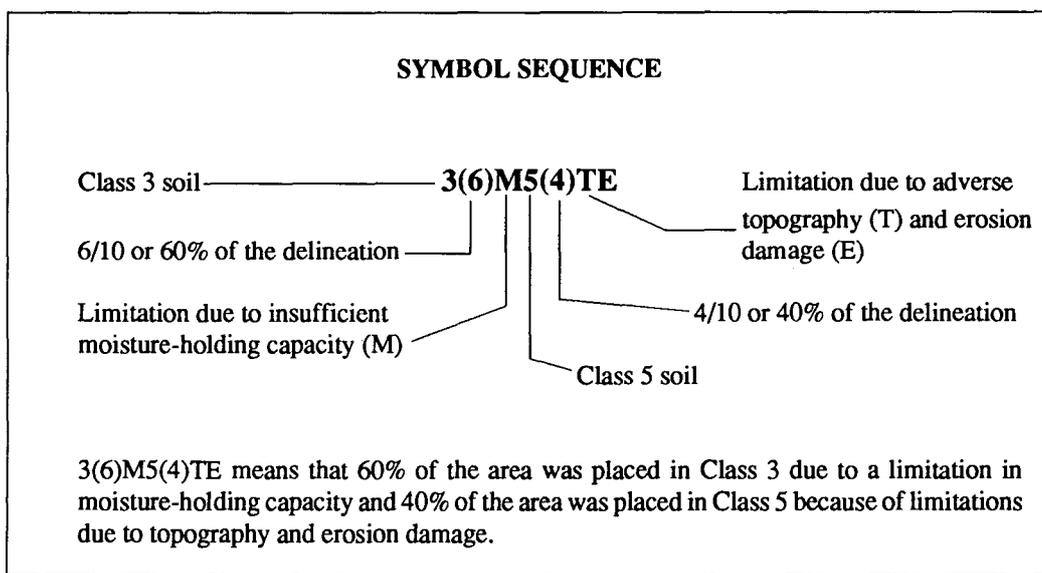
Table 10. Stone classes.

Symbol	Description
S0	Nonstony.
S1	Slightly stony - stones seldom hinder cultivation. Light clearing is occasionally required.
S2	Moderately stony - stones are a moderate hindrance to cultivation. Annual clearing is usually required.
S3	Very stony - stones cause a serious hindrance to cultivation. Sufficient stones to require clearing on an annual basis.
S4	Excessively stony - stones prohibit cultivation or make clearing a major task. Cultivation is usually severely hindered, even after regular, heavy clearing.
U	Unclassified.

4.4 SOIL CAPABILITY FOR AGRICULTURE

The soil capability classification for agricultural use is an interpretive classification of soils based on limitations affecting their use for production of annual crops. These limitations are categorized according to **degree** or severity and **kind** of limitation. Degree of limitation is represented by

the capability class (numbers in the example below) and kind of limitation is represented by the capability subclass (letters in the example below). (The bracketed numbers in the example below indicate the percentage of each capability class present.) Capability classes and subclasses are briefly outlined below. A complete explanation of the system of soil capability classification for agriculture is contained in the publication, **A Guide to Soil Capability and Land Inventory Maps in Saskatchewan**.



Capability Class (Degree of Limitation)

The mineral soils of Saskatchewan are grouped into seven capability classes. Soils rated Classes 1 to 3 are considered suitable for sustained production of common cultivated field crops, those rated Class 4 are considered marginal for sustained production of common cultivated

field crops, those rated Class 5 are considered capable only of permanent pasture and hay production, those rated Class 6 are considered suitable only for use as native pasture, and those rated Class 7 are considered unsuitable for either the production of field crops or for use as native pasture.

Table 11. Description of capability classes.

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, or both.
CLASS 5	Soils in this class have very severe limitations that restrict their use to the production of native or tame species of perennial forage crops. Improvement practices are feasible.
CLASS 6	Soils in this class are capable of producing native forage crops only . Improvement practices are not feasible.
CLASS 7	Soils in this class have no capability for arable agriculture or permanent pasture .
CLASS O	Unimproved or virgin organic soils are not included in classes 1 to 7, and are designated by the letter 'O'.

Capability Subclass (Kind of Limitation)

The capability subclass represents a grouping of soils that have the same kind of limitations for crop production. If more than one limiting condition is recognized in a particular area, the subclasses are listed in order of their importance.

Table 12. Description of capability subclasses.

<u>Climatic Limitations</u> - Limitations due to climatic deficiencies.	
C	Depicts a moisture deficiency due to insufficient precipitation.
<u>Soil Limitations</u> - Limitations due to soil deficiencies are caused by adverse physical, chemical and morphological properties of the soil.	
D	Depicts adverse soil structure in the upper layers (A and B horizons) that affects the condition of the seedbed, prevents or restricts root growth and penetration, or adversely affects moisture permeability and percolation.
F	Depicts adverse fertility characteristics of soils having naturally low inherent fertility due to lack of available nutrients, high acidity or alkalinity, high calcium carbonate content or inadequate cation exchange capacity.
M	Depicts an insufficient soil water-holding capacity, due to the combined effects of the textural characteristics of the top 1 m and by the organic matter content of the surface horizon.
N	Depicts excessive soil salinity and applies to soils with either high alkalinity or a sufficient content of soluble salts to adversely affect crop growth or the range of crops which can be grown.
S	Depicts a variety of adverse soil characteristics. It is used in a collective sense in place of subclasses M, D, F and N, where more than two of them are present, or where two of these occur in addition to some other limitation.
<u>Landscape Limitations</u> - Limitations due to adverse characteristics of the soil landscape.	
T	Depicts a limitation in agricultural use of the soil as the result of unfavorable topography. It includes hazards to cultivation and cropping imposed by increasing degree of slope as well as by the irregularity of field pattern and lack of soil uniformity.
W	Depicts a limitation due to excess water caused by either poor soil drainage, a high groundwater table or to seepage and local runoff. It does not include limitations that are the result of flooding.
P	Depicts a limitation caused by excess stones and it applies to soils that are sufficiently stony that the difficulty of tillage, seeding and harvesting are significantly increased.
E	Depicts a limitation caused by actual damage from wind and/or water erosion.
I	Depicts a limitation due to inundation and applies to soils subjected to flooding by lakes or streams, but does not include local ponding in undrained depressions.
R	Depicts a limitation due to shallowness to bedrock and applies to soils where the rooting zone is restricted.
X	Soils having a moderate limitation due to the accumulative effect of two or more adverse characteristics of the soil and the landscape which singly are not serious enough to affect the class rating.

4.5 SURFACE pH

The pH scale, which ranges from 0 to 14 is used to indicate the relative acidity or alkalinity of a solution. A soil with a pH value of 7.0 is neutral, while one with a value less than 7.0 is acidic, and one with a value greater than 7.0 is alkaline.

The pH values indicated in the table in Section 6.0 are for the surface layer of soil which ranges in thickness from 10 to 20 cm. The soil pH was determined using a mixture of one part soil with one part distilled water. A soil with a pH between 6.5 and 7.5 provides the best environment for crop growth. Yields of sweet clover and alfalfa are reduced below

a pH of 6.0. A pH of 5.5 or less may reduce the yields of wheat, barley and canola.

Table 13. Surface pH classes.

pH Class	pH Range	Description
X	less than 5.5	Moderately acid
A	5.5 to 6.0	Slightly acid
B	6.1 to 6.7	Slightly acid to neutral
C	6.8 to 7.5	Neutral to slightly alkaline
D	greater than 7.5	Alkaline

Table 14. Definition of surface pH symbol.

Symbol	Percent Surface pH Class	Symbol	Percent Surface pH Class
X0	X ¹⁰	B6	B ⁷ X ³
X1	X ⁵ A ³ B ²	C1	C ⁵ B ⁴ D ¹
X2	X ⁷ B ³	C2	C ⁷ B ³
X3	X ⁶ C ² D ²	C3	C ⁷ B ² D ¹
A0	A ⁵ B ⁵	C4	C ⁹ D ¹
A1	A ⁷ B ² C ¹	C5	C ⁵ B ² D ³
A2	A ⁵ B ² C ³	C6	C ⁷ D ³
A3	A ³ B ⁴ C ³	C7	C ⁶ D ⁴
A4	A ³ B ³ C ³ D ¹	D0	D ⁴ C ³ X ³
B0	B ⁷ A ² C ¹	D1	D ⁵ C ⁵
B1	B ⁴ C ⁴ A ²	D2	D ⁷ C ³
B2	B ⁷ C ³	D3	D ⁹ C ¹
B3	B ⁵ C ⁵	D4	D ⁵ C ³ B ²
B4	B ⁶ C ³ D ¹	U	Unclassified
B5	B ⁷ A ³		

EXAMPLE

Symbol → **B1 = B⁴C⁴A²**

B⁴ - 40% of surface area has a pH in the "B" range (6.1 - 6.7)

C⁴ - 40% of surface area has a pH in the "C" range (6.8 - 7.5)

A² - 20% of surface area has a pH in the "A" range (5.5 - 6.0)

4.6 WETLANDS CLASSIFICATION

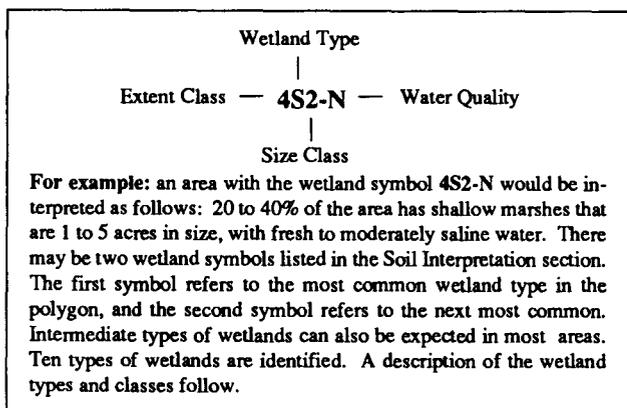
Wetlands are intermittent, semipermanent, or permanent waterbodies and include areas that have been drained as well as areas in which organic soils occur. Undisturbed wetlands are used extensively by wildlife for shelter, breeding habitat, and as feeding areas. Agricultural use of wetlands is often limited. However, some wetlands may provide native forage or hay for livestock, and trees may be used from some organic wetlands. If drained, these wetlands may support annual crop or hay production.

The size and type of wetland is often reflective of the permanence of a wetland. Generally the larger a wetland and the more open water there is, the more permanent it is. Nevertheless, wetlands will be influenced by recent climatic conditions. Due to the drought of the 1980's, for example, many wet meadows and shallow marshes have become dry enough to cultivate. In wetter years, it may be that many of these areas will become flooded and they may not be feasible to farm without installing drainage.

Wetlands occur in almost all areas, but are often not large enough to be mapped as individual areas. The wetlands classification attempts to indicate the types of wetlands that occur in each soil area mapped, as well as their approximate size and extent. It may, however, also be used to describe an individual wetland that is large enough to be delineated on the map. The wetland types can be identified using characteristic vegetation types, and the size and extent of wetlands distributed in the landscape is estimated using air photo interpretation.

Wetland Symbol

The wetlands symbol is composed of: an extent class, followed by a wetland type, a size class, and a water quality rating.



Wetland Types

W- Wet Meadow. Contains vegetation composed mainly of fine-textured grasses and sedges of low stature intermixed with various forbs. Occasionally willows will dominate the wet meadow. Normally wet meadows are flooded for only three or four weeks in the springtime.

- S - Shallow Marsh.** Contains vegetation composed of various intermediate-height grasses, sedges, and forbs. Flooding normally lasts until July or early August.
- E - Emergent Deep Marsh.** Contains vegetation composed of coarse grass-like plants such as bulrushes and cattails. Water normally persists into late summer and fall and occasionally throughout the winter.
- O - Open Water Marsh.** Contains an open water zone that occupies less than 75% of the wetland's diameter. Plants that occur in the open water area are either submerged rooted or floating. Water is normally persistent throughout the year, except in times of extreme drought.
- P - Shallow Open Water Wetland.** The shallow open water wetland has an open water zone that occupies greater than 75% of the wetland's diameter.
- A - Open Alkali Wetland.** Contains a high concentration of salts in the mineral material throughout the extent of the wetland. The length of time the wetland is flooded varies from a few weeks to months. When the wetland is dry, a salt crust usually forms on the soil surface.
- C - Cultivated Wetland.** Any wetland that has been altered by cultivation.
- B - Bog.** Wetlands having an accumulation of mosses and forest peat materials.
- F - Fen.** Wetlands associated with nutrient-rich groundwater, and having an accumulation of sedge residues.
- L - Lake.** Named lakes, and other large waterbodies that are predominantly open water and greater than 2 m in depth.
- N - No Wetlands.** Wetlands occupy less than 1% of the mapped area.

Wetland Extent and Size Classes

The proportion of the polygon that has wetlands is estimated and given an extent class. The main size classes of wetlands in the polygon is also determined.

Table 15. Wetland extent and size class limits.

Extent		Size	
Class	% Area	Class	Area (acres)
1	1 - 5	1	< 1
2	5 - 10	2	1 - 5
3	10 - 20	3	5 - 10
4	20 - 40	4	10 - 20
5	40 - 70	5	20 - 40
6	> 70	6	> 40

Water Quality

Quality of the water is estimated based upon the wetland vegetation.

- N - Fresh to Moderately Saline.** Water conductivity is less than 15,000 $\mu\text{s}/\text{cm}^3$.
- H - Saline to Highly Saline.** Water conductivity is greater than 15,000 $\mu\text{s}/\text{cm}^3$. Plants that are known to occur where it is saline are red samphire, alkali grass, and prairie bulrush.

4.7 WIND EROSION

Wind Erosion Potential

The calculation of wind erosion potential is based on the following formula:

$$E(p) = C \times T \times I \times K$$

E(p) Potential annual soil loss.

C **Climatic factor** (based on average wind velocity and temperature). Values are compiled from weather stations and are presented on a rural municipality basis.

T **Landscape factor** (based on slope class and surface form). Topography, including the differences in relief between one location and another, the direction, steepness and frequency of slopes, and the comparative roughness of the land's surface, has a pronounced effect on the potential erodibility of soils.

I **Soil erodibility factor** (based on texture). The relative proportions of sand, silt and clay present influence a soil's ability to absorb and retain moisture and, consequently, to form aggregates resistant to wind erosion. Coarse-textured soils have a "single grain" structure lacking sufficient amounts of silt and clay to bind individual sand particles together. Consequently, these soils are readily broken down and eroded by wind. Fine and medium-textured soils have a higher water-holding capacity and stronger surface attraction. This results in a good soil structure with a high degree of resistance to wind erosion.

K **Soil ridge roughness factor** (based on texture).

The E(p) values from the formula are used to predict a soil's susceptibility to wind erosion if the soil surface is bare (i.e. it is in summerfallow with no growth and no organic residue on the surface). Management practices and the actual amount of past wind erosion that has occurred are not considered.

Table 16. Wind erosion susceptibility classes.

Class	Susceptibility	Description
1	Very Low	Good soil management and average growing conditions will produce a crop with sufficient residue to protect these soils against wind erosion.
2	Low	Good soil management and average growing conditions may produce a crop with sufficient residue to protect these soils against wind erosion.
3	Moderate	Average growing conditions may not supply adequate residue to protect these soils against wind erosion. Enhanced soil management practices are necessary to control wind erosion.
4	High	Average growing conditions will not provide sufficient residue to protect these soils against wind erosion. Coarse-textured soils may be seeded to pasture or to forage crops to prevent severe degradation of the soil.
5	Very High	These soils should not be used for annual cropping, but rather for pasture and forage crops which will protect the surface from severe degradation.
6	Extremely High	These soils must be left in permanent pasture and are not capable of sustaining arable agriculture.
U	Unclassified	Unclassified areas (e.g. Wetlands).

4.8 WATER EROSION

Water Erosion Potential

The potential water erosion classes are obtained by using the Universal Soil Loss Equation. This equation is an erosion model developed in the United States to predict long term average soil losses from runoff. The equation is:

$$A = R \times K \times L \times S \times C \times P$$

- A** Computed loss per unit area (tons per acre per year).
- R** Rainfall erosivity factor (the amount and intensity of rainfall an area receives).
- K** Soil erodibility factor (calculated using several physical soil properties; texture, organic matter, infiltration rate and structure).

- L** Slope length factor.
- S** Slope steepness factor.
- C** Cover and management factor.
- P** Support practice factor.

Assessment of potential water erosion for a particular area is independent of current management practices and therefore the C and P factors in the equation are held constant.

When using this information, it should be remembered that the class assigned to an area is an estimation of potential erosion for the entire area and that individual soils may occur within the area that vary significantly from the assigned class.

Table 17. Water erosion susceptibility classes.

Class	Susceptibility	Description
1	Very Low	Conventional soil management will produce sufficient residue to protect the soil from water erosion.
2	Low	Conventional soil management and average growing conditions should produce sufficient residue to protect the soil from water erosion.
3	Moderate	Conventional farming practices will result in a steady loss of soil due to water erosion. Conservation practices should be instituted to prevent degradation of these soils.
4	High	Rapid loss of soil will occur unless conservation practices are instituted. All gullies in these areas should be grassed.
5	Very High	These soils should not be broken due to their water erosion hazard. If broken, perennial crops or permanent forage should replace annual crops.
U	Unclassified	Unclassified areas (e.g. Wetlands).
D or G Modifiers		If an area was observed to be gullied (G) or dissected (D) (dissections being shallow gullies that can be crossed with farm implements), these symbols were added to the erosion class symbol to indicate that higher rates of erosion may occur on the steeper slopes along the edges of the dissection or gully if they are left unprotected.

4.9 PAST WIND AND WATER EROSION

An erosion rating has been assigned to each soil area. This rating reflects the surveyor's best estimate of the extent and degree of erosion that has occurred in an area since cultivation. Areas that have never been cultivated usually have enough vegetative cover to protect the soil surface from erosion and, therefore, remain relatively unaffected. Some

uncultivated areas, however, do have clear evidence of recent erosion.

The rating system contains six classes with the degree of past wind and water erosion ranging from unaffected (W0) to very severe (W5). These classes, with the exception of W0 (unaffected), are assigned modifiers (G, K, B) which identify the type of erosion that has occurred. Wetlands, nonsoil areas and some uncultivated areas were not classified and are designated with the symbol 'U'.

Table 18. Past wind and water erosion classes.

Class	Description
U	Unclassified
W0	Unaffected. No evidence of past wind or water erosion.
W1	Weak. Soils are slightly eroded.
W1K	The knolls have slightly thinner A horizons and are lighter in color than midslopes. There is no noticeable thickening of the surface horizon on mid- to lower slopes.
W1B	Wind has removed part of the soil surface resulting in thinner A horizons. There is very little mixing of the A and B horizons and little sign of soil accumulation on mid- and lower slopes.
W1G	A few very shallow dissections are present indicating very slight evidence of water erosion.
W2	Moderate. Soils are moderately eroded.
W2K	Eroded knolls make up 5-15% of the area. The knolls are much lighter in color than midslopes. There is a noticeable thickening of the surface horizon on lower slopes due to accumulation of upper slope material.
W2B	Wind has removed part of the A horizon resulting in moderately thin A horizons. There is slight mixing of A and B horizons during tillage and some evidence of soil accumulation near fencelines and windbreaks.
W2G	Shallow dissections are present. The dissections may easily be crossed by farm implements and have little effect on cultivation. There is evidence of rill erosion (small channels a few centimeters deep, occurring after substantial rains or snowmelt).
W3	Strong. Soils are strongly eroded.
W3K	Eroded knolls make up 15-40% of the area. The knolls are much lighter in color than midslopes. A large portion of the A horizon has been removed and redistributed to lower slopes. On knolls, subsoil has been incorporated into the cultivated horizon.
W3B	Wind has removed a significant amount of the A horizon. Regular tillage results in a thorough mixing of the B horizon with the remaining A horizon. Accumulation of wind-blown material occurs along fencelines and windbreaks.
W3G	Distinct dissections are present. The dissections may be crossed by farm implements with some difficulty, and have a moderate effect on cultivation. These dissections should be seeded to grass to prevent further damage from erosion.
W4	Severe. Soils are severely eroded.
W4K	Eroded knolls make up 40-70% of the area. The eroded knolls are white in color, with light colors extending well onto the midslope position. Erosion has destroyed the soil profile on upper slopes.
W4B	Wind has removed most of the A horizon and frequently part of the B horizon. Occasional blowout areas are present, creating a very unstable surface.
W4G	Occasional shallow gullies are present. The gullies cannot be crossed by farm implements, and therefore, should not be cultivated for annual cropping. Reclamation for improved pasture is difficult unless erosion can be controlled.
W5	Very Severe. Soils are very severely eroded.
W5K	Eroded knolls make up greater than 70% of the area. The knolls and midslopes are white in color. Erosion has destroyed the soil profile on upper and midslope positions.
W5B	Wind has removed most of the soil profile. Blowout holes are numerous and easily carved into the subsoil or parent material. Areas between blowouts are deeply buried by eroded soil material. At best, this land should be utilized for native or improved pasture.
W5G	Deep gullies occur frequently. Soil profiles have been destroyed except in small areas between gullies. These areas should be permanently grassed. Reclamation of eroded areas is a difficult process.

4.10 SAND AND GRAVEL

The sand and gravel symbol shows the location of near surface sources of sandy and gravelly materials. The materials can range from mixtures of sand and silt to coarse gravelly sand. These materials may be used for concrete, sub-base for roads, traffic gravel or pervious borrow for fill

purposes. This symbol does not suggest whether any of these areas contain sands and gravels of sufficient volume or quality to enable commercial development.

The term sand refers to materials with greater than 50% sand and with less than 15% clay. Gravel refers to materials having a significant component of particles greater than 2 mm in diameter.

Table 19. Description of sand and gravel symbol.

Symbol	Description	Symbol	Description
SG0	No sandy or gravelly materials recognized	G3	Gravelly materials occupy 40-70% of landscape
S1	Sandy materials occupy 1-15% of landscape	SG3	Sandy and gravelly materials occupy 40-70% of landscape
G1	Gravelly materials occupy 1-15% of landscape	S4	Sandy materials occupy greater than 70% of landscape
SG1	Sandy and gravelly materials occupy 1-15% of landscape	G4	Gravelly materials occupy greater than 70% of landscape
S2	Sandy materials occupy 15-40% of landscape	SG4	Sandy and gravelly materials occupy greater than 70% of landscape
G2	Gravelly materials occupy 15-40% of landscape	U	Unclassified
SG2	Sandy and gravelly materials occupy 15-40% of landscape		
S3	Sandy materials occupy 40-70% of landscape		

Characteristics of Sand and Gravel Pits

The following table lists the legal location, and provides information on various characteristics, of sand and gravel pits in this municipality. The data was compiled by the Sas-

katchewan Research Council based on detailed field investigations by the Saskatchewan Department of Highways and Transportation.

Table 20. Gravel pit characteristics.

1/4	Legal Location				Tested Thickness (m)	Texture (%)			Comments
	Sec	Twp	Rg	Mer		Gravel*	Sand	Fines	
SE	5	25	13	2	3.0	27.2	67.0	5.7	Clean gravelly sand, 1% material greater than 80 mm, watertable encountered in most testpits, till at bottom of deposit.
SE	27	26	13	2	3.3	4.3	79.8	15.8	Very dirty sand, no material greater than 80 mm, watertable encountered in some testpits, till at bottom of deposit.
SE	3	26	14	2	2.7	16.6	75.5	7.8	Dirty gravelly sand, no material greater than 80 mm, till at bottom of deposit.
NW	29	25	15	2	3.5	33.1	62.7	4.0	Clean gravelly sand, no material greater than 80 mm, very thin overburden, till at bottom of deposit.
NE	19	26	15	2	2.5	43.1	54.2	2.6	Clean gravelly sand, no material greater than 80 mm, watertable encountered in most testpits, till at bottom of deposit.
SW	29	27	15	2	4.8	5.1	76.1	18.7	Very dirty sand, no material greater than 80 mm.

* "Gravel" refers to material greater than 5 mm in diameter (Industrial Classification).
 "Sand" refers to material greater than 0.071 mm and less than 5 mm in diameter.
 "Fines" refers to material less than 0.071 mm in diameter.

4.11 SOIL MOISTURE AND YIELD

An estimate of the amount of available soil moisture may be of value in decision-making regarding the seeding of stubble land and the level of fertilizer inputs required. In most cases, such decisions rely, in part, on an estimate of expected yield. Since yield is largely a function of soil moisture conditions, an estimate of the amount of soil moisture available to the crop over the growing season can be used to assess the probability of obtaining a given yield.

Calculation of Available Soil Moisture

To calculate the amount of available water in the soil, multiply the soil's available water-holding capacity (see Table 21) by the depth of moist soil.

Table 21. Available soil water-holding capacity in relation to soil texture.

Texture Class	Available water-holding capacity per unit depth of moist soil
Loamy sand	0.05
Sandy loam	0.08
Fine sandy loam	0.09
Very fine sandy loam	0.10
Sandy clay loam	0.12
Loam	0.14
Silt loam	0.16
Clay loam	0.17
Silty clay loam	0.20
Clay	0.21
Silty clay	0.22
Heavy clay	0.23

Example: If a loam-textured soil were moist to a depth of 500 mm, it would contain about 70 mm (500 x 0.14) of available water.

Estimation of Potential Yield

The amount of soil moisture available to the crop equals the amount stored in the soil prior to seeding, plus that received as precipitation during the growing season. Available soil moisture prior to seeding can be estimated using Table 21. The probability of receiving various amounts of precipitation over the growing season is given in Table 22.

Table 22. Probability (%) of receiving at least the indicated amounts of growing-season precipitation (May 15 to August 13).

Precipitation (mm) ^a										
55	70	110	145	160	185	210	225	250	265	
Probability (%)										
>95	90	85	75	65	50	35	25	15	10	

^a Precipitation data from Kelliher weather station.

Example: If the probability of receiving 185 mm of precipitation were 50%, then at least 185 mm of precipitation could be expected in 5 out of 10 years.

To assess the probability of obtaining a given yield:

1. Estimate the available soil moisture prior to seeding.
2. Determine the total moisture requirements (Table 23).
3. Assess the probability of receiving enough precipitation during the growing season to make up the difference.

Example: If a loam-textured soil were moist to a depth of 500 mm, what would be the probability of obtaining a wheat yield of at least 1500 kg/ha?

1. Stored soil moisture = (500 x 0.14) = 70 mm.
2. Total moisture requirements = 200 mm.
3. Moisture required = (200 - 70) = 130 mm.
4. Probability of receiving at least 130 mm is about 79%.

Table 23. Estimated yields^b (kg/ha) in relation to available moisture requirements.

Crop	Moisture requirements (mm)										To convert kg/ha to bu/ac multiply by:
	125	150	175	200	225	250	275	300	325	350	
Wheat	600	900	1200	1500	1800	2100	2400	2700	3000	3300	.015
Oats	640	950	1270	1590	1910	2230	2540	2860	3180	3500	.026
Barley	740	1110	1480	1850	2210	2580	2950	3320	3690	4060	.019
Flax	360	500	660	830	990	1160	1320	1490	1650	1820	.016
Canola	360	540	720	900	1080	1270	1440	1620	1800	1980	.018

^b Yields are based on good management and reasonably normal seasonal climatic conditions, particularly with respect to the timeliness of rainfall events. Actual yields may exceed estimates under abnormally favorable conditions, or be below estimates due to weeds, disease, low fertility, or adverse climatic extremes.

5. ACREAGE FACTS

Rural Municipality of Kellross, Number 247

Hectares	Acres	Hectares	Acres
TOTAL AREA		94226	232832
SOIL CAPABILITY FOR AGRICULTURE			
Class 1	38	93	
Class 2	26922	66524	
Class 3	35304	87236	
Class 4	11080	27379	
Class 5	16760	41414	
Class 6	3835	9476	
Class 7	269	664	
Class 0	0	0	
IRRIGATION SUITABILITY			
Excellent	0	0	
Good	107	265	
Fair	73375	181309	
Poor	20725	51212	
SALINITY			
Very Strong	0	0	
Strong	3	7	
Moderate	972	2402	
Weak	633	1564	
None	92618	228859	
SAND AND GRAVEL			
Sandy	23	57	
Sandy and Gravelly	5021	12406	
Gravelly	1761	4351	
STONES			
Non- to Slightly Stony	5983	14783	
Moderately Stony	86848	214602	
Very Stony	563	1392	
Excessively Stony	0	0	
SURFACE pH (Soil Acidity)			
X (< 5.5)	0	0	
A (5.5 - 6.0)	0	0	
B (6.1 - 6.7)	0	0	
C (6.8 - 7.5)	14754	36457	
D (> 7.5)	78640	194320	
SURFACE TEXTURE			
Sands	119	293	
Sandy Loams	1053	2602	
Loams	90056	222529	
Clay Loams	1936	4785	
Clays	229	567	
Organics	0	0	
WIND EROSION POTENTIAL			
Very Low	0	0	
Low	91725	226653	
Moderate	1016	2510	
High	653	1614	
Very High	0	0	
Extremely High	0	0	
WATER EROSION POTENTIAL			
Very Low	953	2355	
Low	65597	162089	
Moderate	23097	57073	
High	2999	7411	
Very High	748	1849	
WETLANDS AND POORLY DRAINED SOILS			
Open water and lakes	494	1221	
Wet, poorly drained soils	18630	46034	

6. INTERPRETIVE DATA TABLES

Area No.	Map Unit	Slope Class	Land Form	Surface Texture	Salinity	Irrigation	Stone Class	Agricultural Capability	pH	Wetlands Classification	Wind Eros.	Water Eros.	Past Eros.	Sand/Gravel	Acres (ac)
1	WhWv6	5	hd	l	1MA	2Ddsv	S2	4(7)T5(3)TW	D2	3S3-N,1C1-N	2	5D	W3K	SG1	739.9
2	Le2	4	h	l	1WA	1Ct2v	S1	3(8)T5(2)W	D1	2S2-N,1C1-N	2	2	W2KB	SG0	53.4
3	Cd2	2-3	u	cl	1MA	2Dqsv	S1	2(6)X4(2)W5(2)W	D1	4S4-N,2C3-N	2	1	W1B	SG0	143.9
4	WvWh5	4	h	l	1WA	2Cdt2v	S2	3(8)DT5(2)W	D2	2S2-N,1C1-N	2	3	W2KG	SG1	232.6
5	Wh8	5	hd	l-cl	1MA	2Dsv	S2	4(7)T5(3)WT	D3	3S2-N,1C1-N	2	4D	W3K	SG1	929.1
6	GbNt1	5-4	h	gsi-sl	1WA	3Cmt2	S1	4(9)TM5(1)W	D3	2S2-N,1C1-N	4	3	W1B	SG4	148.7
7	Cd20	2	u	cl	2MA	3Dsv	S1	2(4)M4(2)W5(4)W	D2	5C6-N	2	1	W1B	SG1	461.8
8	Wz2	2-3	u	U	2MA	4Cwi	U	5(6)W6(4)W	U	5S5-N	U	U	U	SG0	223.2
9	Ka9	3-4	h	cl	1MA	2Cqt2v	S1	2(6)M3(2)T5(2)W	D2	3S2-N,1C1-N	2	2	W1K	SG0	212.7
10	GbNt1	5	h	gsi-sl	0	3Cmt2	S2	4(10)TM	D2	1S1-N	4	2	W1B	SG4	131.7
11	Le2	4-3	h	cl	1WA	2Cqt2v	S1	2(4)M3(4)T5(2)W	D2	2S2-N,2C1-N	2	2	W1K	SG0	500.7
12	WhWv6	5-4	h	l-cl	1WA	2Cdt2v	S2	3(4)TD4(4)T5(2)W	D2	3S2-N,1C1-N	2	3	W2K	SG1	292.8
13	Le5	6-5	h	l-cl	1MP	2Dst2v	S2	6(4)W5(3)T4(3)TP	D2	4S2-N,3C4-N	2	5	W1K	SG1	244.3
14	Le5	5-4	h	cl-l	1WA	2Cqt2v	S2	4(6)T3(2)T5(2)W	D2	2S2-N,1C1-N	2	3	W2K	SG1	886.0
15	Wz3	2	u	U	2MA	4Cwi	U	6(10)W	U	6O6-N	U	U	U	SG0	118.8
16	WsMe1	5	h	gsi-sl	1WA	3Cmt2	S1	4(9)MT5(1)W	D2	2S1-N	4	2	W1BK	SG4	69.7
17	Wv2	5	h	l	1MA	2Cdt2v	S2	4(8)T5(2)W	D2	3S2-N,1C1-N	2	3	W1K	SG1	116.6
18	OxWh5	4	h	l-cl	1MA	2Cst2v	S2	3(8)T5(2)W	D3	3S2-N,2C1-N	2	2	W1K	SG1	2219.4
19	Wz2	1	l	U	2MA	4Cwi	U	6(10)W	U	6O6-N	U	U	U	SG0	32.9
20	Wv2	4	h	l	1WA	2Cdt2v	S2	3(8)D5(2)W	D2	3S2-N,1O3-N	2	2	W1K	SG1	1644.9
21	Wz2	1	l	U	2MA	4Cwi	U	6(10)W	U	5O6-N,2S1-N	U	U	U	SG0	217.3
22	WsGb1	4-3	h	gsi	1WP	4Cmt2	S2	4(9)M5(1)W	D3	2S1-N	4	2	W1K	G4	592.9
23	Wz1	1	l	U	2MA	4Cwi	U	5(6)W6(4)W	U	6S6-N	U	U	U	G4	59.2
24	OxWh5	5-4	h	cl-l	1MA	2Cqt2v	S2	3(4)T4(4)T5(2)W	D3	3S2-N,1C1-N	2	3	W1K	SG1	1960.3
25	Ox8	4	h	l	1WA	1Ct2v	S2	3(8)T5(2)W	D3	3S2-N,1C1-N	2	2	W2K	SG1	1390.9
26	CmSd2	4-5	h	l-sl	1WA	1Ct2v	S2	3(5)MT4(3)T5(2)W	D1	3S2-N	2	3	W2K	SG0	1211.7
27	Wz1	1	l	U	2MA	4Cwi	U	5(6)W6(4)W	U	6S6-N	U	U	U	SG0	68.9
28	Wz1	2	u	U	2MA	4Cwi	U	6(10)W	U	5S6-N	U	U	U	SG0	33.8
29	Ox8	3-4	h	l	1MP	2Cst2v	S2	2(6)M3(2)T5(2)W	D3	3S2-N,1O2-N	2	2	W1KG	SG1	8078.5
30	Ox8	4	h	l	1WA	1Ct2v	S2	3(8)TP5(2)W	D3	3S2-N	2	2	W1K	SG1	154.0
31	Wz1	2	u	U	2MA	4Cwi	U	6(10)W	U	5S6-N	U	U	U	SG0	36.6
32	Me1	4	h	ls	0	3Cmt2	S2	4(10)M	D3	1S1-N	4	1	W1B	S4	71.5
33	OxHd8	3-4	h	l	1MA	2Cst2v	S2	2(6)M3(2)T5(2)W	D3	3S2-N,1C1-N	2	2	W1K	SG0	504.5
34	Wz1	2	u	U	1MA	4Cwi	U	5(10)W	U	6S6-N	U	U	U	SG0	39.1
35	BaOx11	2-3	u	c-cl	2MA	3Dqsv	S1	2(5)X4(2)W6(3)W	D3	4O5-N,2C5-N	2	1	W1BG	SG0	152.3
36	BaOx11	2-3	u	c-cl	2MA	3Dqsv	S1	2(5)X4(2)W6(3)W	D3	4O5-N,2C5-N	2	1	W1BG	SG0	414.8
37	CdKa1	3	u	l-cl	1WA	1Bv1	S1	2(9)M5(1)W	D1	2S2-N	2	2	W2BG	SG1	78.1
38	OxW54	4-5	hd	l-gsi	1WA	1Dv	S2	3(6)TP4(3)TM5(1)W	D2	1S1-N,1C1-N	2	3D	W2KG	G2	473.5
39	Ox8	4	h	l	1MA	2Cst2v	S2	3(8)T5(2)W	D3	3S2-N	2	2	W1K	SG1	435.5
40	OxHd8	3-4	h	l	1MA	2Cst2v	S2	2(6)M3(2)T5(2)W	D3	3S2-N,1C1-N	2	2	W1K	SG0	525.6
41	OxWh2	5	h	l-cl	1MA	2Cst2v	S2	4(8)T5(2)W	D3	3S3-N,1C1-N	2	3	W3K	SG1	209.4
42	WhTg5	4-5	h	l-cl	1MA	2Cst2v	S2	3(6)T4(2)T5(2)W	D3	3S3-N,2C2-N	2	3	W2K	SG1	596.6
43	Cd20	2	u	cl	2MA	3Dsv	S1	2(4)M4(2)W5(4)W	D2	5C6-N	2	1	W1B	SG1	185.6
44	Ox4	5-6	hid	l	0	1Dt2	S2	4(6)T5(4)T	D3	1C1-N	2	4D	W2GK	SG1	69.0
45	WhWv2	4	h	l-cl	1MA	2Cdt2v	S2	3(8)TD5(2)W	D2	3S2-N,1C1-N	2	3	W2K	SG1	1510.1
46	WhWv2	4-5	h	l-cl	1MA	2Ddsv	S2	3(5)TD4(2)T5(3)W	D2	3S2-N,2C1-N	2	2	W2K	SG1	740.8
47	Wh8	3-4	h	l-cl	1WP	1Ct2v	S2	2(5)M3(3)T5(2)W	D2	3S2-N,1P3-N	2	2	W1K	SG1	2529.2
48	WhWv8	4-5	h	l-cl	1WP	2Cdt2v	S2	3(6)DT4(2)T5(2)W	D2	2S2-N,2C2-N	2	2	W3K	SG1	459.0
49	WhWv8	4-5	h	l-cl	1WP	2Cdt2v	S2	3(6)DT4(2)T5(2)W	D2	2S2-N,2C2-N	2	2	W3K	SG1	71.7
50	WhWv2	3-4	h	l-cl	1WP	2Cdt2v	S2	3(5)DT2(3)M5(2)W	D2	3S2-N,1P3-N	2	2	W1K	SG0	223.9
51	WhWv2	3	h	l	1WP	2Cdpv	S3	3(5)DP2(3)M5(2)W	D2	2S2-N,2C1-N	2	2	W1K	SG0	185.6
52	OxNc12	3	h	l-cl	2MP	3Dsv	S2	2(4)MT3(2)P5(4)W	D3	4S4-N,2C3-N	2	2	W1K	SG0	248.2
53	Wz2	1	l	U	2MPA	4Cwi	U	6(6)W5(4)W	U	6E6-N	U	U	U	SG0	87.9
54	WhOx2	3-4	h	l	1MP	2Cst2v	S2	2(5)M3(3)TP5(2)W	D2	2S2-N,2E3-N	2	2	W1K	SG0	2404.9
55	Wh8	5-4	hd	l	1MP	2Cst2v	S2	4(5)T3(3)T5(2)W	D2	3P4-N,1S1-N	2	3D	W3KG	SG0	164.0
56	Ox20	3	h	l	2MP	3Dsv	S3	5(3)PW6(3)W2(4)M	D3	4P6-N,3S3-N	2	2	W1K	SG1	474.6
57	Wz3	1	l	U	2MP	4Cwi	U	7(6)W6(4)W	U	5E5-N,5C4-N	U	U	U	SG0	44.9
58	HdOx6	3	u	l-cl	2MP	3Csv	S2	2(6)M1(2)5(2)W	D3	2E3-N,2S2-N	2	2	W1K	SG0	366.9
59	Wz3	1	l	U	2MP	4Cwi	U	7(6)W6(4)W	U	5O6-N,5E6-N	U	U	U	SG0	94.8
60	WhOx2	3-4	h	l	1MP	2Cst2v	S2	2(5)M3(3)TP5(2)W	D3	3C1-N,1P4-N	2	2	W1K	SG0	1854.2
61	Ox4	5-6	hid	l	1WP	1Dt2	S2	4(7)TE5(3)T	D3	1C1-N	2	4D	W4KG	SG0	133.9
62	HdOx6	3-2	u	sil-l	2MP	3Dsv	S2	2(6)M3(1)P5(3)W	D3	3O4-N,2G2-N	2	2	W1K	SG0	138.2
63	Wz3	1	l	U	2MP	4Cwi	U	7(10)W	U	6L6-N	U	U	U	SG0	103.5
64	WhOx2	5-4	h	l	1MP	2Dsv	S2	4(4)T3(3)TP5(3)W	D3	3P4-N,2E2-N	2	3	W3K	SG0	528.9
65	OxWh4	3-4	h	l	1WP	1Ct2	S2	2(7)M3(3)T	D3	1S2-N	2	2	W1K	SG0	169.0

Area No.	Map Unit	Slope Class	Land Form	Surface Texture	Salinity	Irrigation	Stone Class	Agricultural Capability	pH	Wetlands Classification	Wind Eros.	Water Eros.	Past Eros.	Sand/Gravel	Acreage (ac)
66	Ox2	4-6	h	l	1MP	2Dst2v	S3	4(4)TP3(2)T5(4)TW	D3	3P3-N,2S2-N	2	3	W3K	SG1	328.6
67	OxHd6	3	h	cl-l	2MP	3Dsv	S2	2(7)MT5(3)W	D3	3E4-N,2S3-N	2	2	W1K	SG0	319.2
68	Ox2	5-4	h	l	1MP	2Dsv	S2	4(4)TE3(3)T5(3)WT	D3	2P2-N,2S1-N	2	3	W3K	SG0	271.7
69	Ox8	3-4	h	l	2WPA	2Cst2v	S2	2(5)M3(3)T6(2)W	D3	3E2-N,2C2-N	2	2	W2K	SG1	12053.7
70	Wh8	4-5	h	l	1MP	2Cst2v	S2	3(5)T4(3)T5(2)W	D2	3S2-N	2	2	W2K	SG1	141.2
71	HdOx9	3-2	u	l-cl	2MP	3Dsv	S2	2(4)M1(1)5(5)W	D3	4E4-N,3S4-N	2	2	W1K	SG0	194.1
72	Ox18	4-5	h	l-gi	2WP	2Cst2v	S2	3(4)T4(4)T5(2)W	D3	3W2-N,2C2-N	2	2	W3K	SG1	426.2
73	WhWv2	5-4	h	l	1MP	2Cdt2v	S2	4(5)TP3(3)TD5(2)W	D2	3E3-N,1S2-N	2	4	W3K	SG0	822.1
74	Wh6	5-4	h	l	1MP	2Cst2	S2	4(5)T3(4)TP5(1)W	D2	1S1-N,1C1-N	2	3	W2K	SG1	134.2
75	OxHd6	3-2	u	l	4MPA	4Dsv	S2	2(3)M4(3)PN6(4)W	D3	3P5-N,3S4-N	2	2	W1K	SG0	761.4
76	WhWv2	4-3	h	l	1MP	2Cdt2v	S2	3(5)DT2(3)M5(2)W	D2	2P3-N,2S2-N	2	2	W1K	SG0	176.8
77	WhWv2	4-3	h	l	1MP	2Cdt2v	S2	3(5)DT2(3)M5(2)W	D2	2P3-N,2S2-N	2	2	W1K	SG0	279.5
78	WhWv2	4-3	h	l	1MP	2Cdt2v	S2	3(5)DT2(3)M5(2)W	D2	2P3-N,2S2-N	2	2	W1K	SG0	4366.9
79	WhWv2	4-3	h	l	1MP	2Cdt2v	S2	3(5)DT2(3)M5(2)W	D2	2P3-N,2S2-N	2	2	W1K	SG0	370.0
80	Wz3	1	l	U	2MP	4Cwi	U	7(10)W	U	6P6-N	U	U	U	SG0	160.0
81	Wz2	1	l	U	2MP	4Cwi	U	6(10)W	U	6E6-N	U	U	U	SG0	55.4
82	WhOx2	3	h	l	1MP	2Csv	S2	2(8)M5(2)W	D2	2E3-N,2S2-N	2	2	W1K	SG0	1006.8
83	WhOx8	3-4	h	l	1MP	2Dsv	S3	2(3)M3(3)TP5(4)WP	D2	3S3-N,1P2-N	2	2	W1K	SG0	332.0
84	WhWv2	3-4	h	l-sl	1WP	2Cdt2v	S2	2(5)DM3(3)TM5(2)W	D2	2S2-N,2C1-N	2	2	W2K	SG0	456.5
85	WhWv8	4-5	h	l-sl	1WP	2Cdt2v	S2	3(5)T4(3)T5(2)W	D2	2S2-N,2C1-N	2	2	W3K	SG1	27.0
86	WhWv8	4-5	h	l-sl	1WP	2Cdt2v	S2	3(5)T4(3)T5(2)W	D2	2S2-N,2C1-N	2	2	W3K	SG1	1192.7
87	WhWv8	4-5	h	l-sl	1WP	2Cdt2v	S2	3(5)T4(3)T5(2)W	D2	2S2-N,2C1-N	2	2	W3K	SG1	6458.6
88	GbWh5	3	hd	sl-l	1MP	3Dmv	S1	3(5)M2(2)M5(3)W	D3	3S3-N,2C2-N	3	2D	W3BK	G3	34.9
89	OxWh2	4-3	h	l	1MP	2Cst2v	S2	3(5)T2(3)M5(2)W	D2	2S2-N,2C1-N	2	2	W2K	SG1	1635.5
90	Rw	5-6	hd	l	1MP	4Dct2	S2	5(8)WT4(2)T	D3	5O3-N,3S1-N	2	5D	W2G	SG1	170.5
91	WhWv2	3	h	l	1MP	2Cdsv	S2	2(4)D3(4)DP5(2)W	D2	2P4-N,2C2-N	2	2	W1K	SG0	428.4
92	WhWv2	3-4	h	l-sl	1WP	2Cdt2v	S2	2(5)DM3(3)TM5(2)W	D2	2S2-N,2C1-N	2	2	W2K	SG0	449.9
93	WhWv2	3-4	h	l-sl	1WP	2Cdt2v	S2	2(5)DM3(3)TM5(2)W	D2	2S2-N,2C1-N	2	2	W2K	SG0	1563.8
94	OxYk5	3-4	h	l-cl	1MP	2Cst2v	S2	2(6)MT3(2)T5(2)W	D3	2S2-N,2C1-N	2	2	W1K	SG0	2282.6
95	Wz3	1	l	U	2MP	4Cwi	U	7(7)W6(3)W	U	6O6-N	U	U	U	SG0	104.9
96	OxWs8	3-4	h	l-gsl	1MP	2Dsv	S2	2(6)M4(2)M5(2)W	D3	2S1-N,2C1-N	2	2	W1K	G2	281.8
97	Wz1	1	l	U	2MPA	4Cwi	U	5(7)W6(2)W7(1)W	U	6S5-N,1O2-N	U	U	U	SG0	40.8
98	OxYk8	4-3	h	l	1MP	2Cst2v	S2	3(5)T2(3)MT5(2)W	D3	2S2-N,1O2-N	2	2	W2K	SG1	4132.3
99	OxYk5	3-4	h	l-cl	2MPA	3Cst2v	S1	2(6)MT3(2)T5(2)W	D3	3S2-N	2	2	W1K	SG0	85.2
100	OxYk12	3-4	h	l	2MPA	3Dsv	S1	2(5)MT3(2)T5(3)W	D3	3O3-N,3C1-N	2	2	W1K	SG0	202.6
101	OxYk6	3	h	l	1MP	2Dsv	S2	2(5)MT3(3)W5(2)W	D3	2O2-N,2S2-N	2	2	W1K	SG0	540.8
102	OxYk2	4-5	hr	l	1MP	2Cst2v	S2	3(6)T4(2)T5(2)W	D3	2S2-N,2C1-N	2	2	W2K	SG1	559.8
103	OxYk4	3-4	hd	l	1MPA	2Cst2	S2	2(5)MT3(4)T5(1)W	D3	2S2-N	2	2D	W2K	SG0	21.0
104	NcOx7	3	hd	l-sicl	2MPA	3Bst2v	S1	2(9)TM3(1)N	D3	1S2-N	2	2D	W1G	SG0	60.4
105	HdNc7	3-4	h	sil	0	1Ct2	S1	2(8)MT3(2)T	D2	1C1-N	2	2	W1K	SG1	120.0
106	OxWh2	4-3	h	l	1MP	2Cst2v	S2	3(5)T2(3)M5(2)W	D2	2O2-N,2S2-N	2	2	W2K	SG0	590.3
107	OxNc2	3-4	h	l-sil	1MP	2Cst2v	S2	2(6)MT3(2)T5(2)W	D3	2S2-N,2C1-N	2	2	W1K	SG0	111.8
108	OxNc2	3-4	h	l-sil	1MP	2Cst2v	S2	2(6)MT3(2)T5(2)W	D3	2S2-N,2C1-N	2	2	W1K	SG0	185.2
109	HdOx12	3	h	sil-l	1MP	2Csv	S2	2(8)M5(2)W	D2	2S1-N,2C1-N	2	2	W1K	SG0	70.7
110	OxYk8	3-4	h	l	1MP	2Cst2v	S2	2(5)MT3(3)T5(2)W	D3	2S2-N,2C1-N	2	2	W2K	SG0	2296.9
111	OxYk2	3	h	l-cl	1MP	2Csv	S2	2(8)MT5(2)W	D3	2S2-N,2C1-N	2	2	W1K	SG1	1116.3
112	OxNc2	3	h	l-sil	2MPA	3Csv	S1	2(8)MT4(1)WN5(1)W	D2	2S2-N,2C1-N	2	2	W1K	SG0	283.2
113	Mw2	2-3	u	l	4MPA	4Cwi	S2	6(4)W5(3)W4(3)NW	D3	5E6-N,2S3-N	2	1	U	SG0	21.0
114	OxWs11	4-3	hr	l-sl	1MP	2Dsv	S1	3(4)TM2(3)M4(3)MW	D3	2S2-N,2C1-N	2	2	W2KB	G2	211.3
115	OxYk8	4-3	h	l	1MP	2Cst2v	S2	2(4)MT3(4)T5(2)W	D3	2S2-N,2C1-N	2	2	W2K	SG0	615.3
116	OxYk5	3	h	l	1MP	2Csv	S2	2(8)MT5(2)W	D3	2S1-N,2C1-N	2	2	W1K	SG0	527.7
117	OxNc2	3-4	h	l-cl	2MPA	3Cst2v	S2	2(6)MT3(2)T5(2)W	D2	3S2-N,3C1-N	2	2	W2K	SG1	372.2
118	OxNc2	3-4	h	l-cl	2MPA	3Cst2v	S2	2(6)MT3(2)T5(2)W	D2	3S2-N,3C1-N	2	2	W2K	SG1	1160.1
119	OxWs11	4-5	h	l-gsl	1SP	2Dsv	S2	3(4)T4(4)MT5(2)W	D3	3S2-N,2C1-N	2	2	W2K	G2	845.9
120	OxWs11	4-5	h	l-gsl	1SP	2Dsv	S2	3(4)T4(4)MT5(2)W	D3	3S2-N,2C1-N	2	2	W2K	G2	100.1
121	Wz2	1	l	U	2MP	4Cwi	U	6(10)W	U	6E6-N	U	U	U	SG0	54.7
122	Ox8	4-5	h	l-cl	1MP	2Cst2v	S2	3(5)T4(3)T5(2)W	D3	3S1-N,2O1-N	2	2	W2K	SG0	281.7
123	Ox11	5-6	h	l	1MPA	2Dst2	S2	4(5)T5(3)T6(2)W	D3	3S2-N,2O3-N	2	4	W3KG	SG0	303.9
124	Ox11	4-3	h	l	2MPA	3Cst2v	S2	3(5)T2(3)M5(2)W	D3	3E2-N,2W2-N	2	2	W2K	SG0	6861.2
125	Ox8	4-3	h	l	1WPA	1Ct2v	S2	3(5)T2(3)M5(2)W	D3	3W2-N,2C2-N	2	2	W3K	SG0	798.9
126	Ox11	3-5	h	l	2MPA	3Dst2v	S2	3(4)T4(3)T6(3)W	D3	3O3-N,3S2-N	2	2	W3K	SG0	546.6
127	Ox18	3-5	h	l-cl	1MP	2Dst2v	S2	2(4)MT3(3)T5(3)WT	D3	3E3-N,3S3-N	2	3	W1K	SG0	298.8
128	OxWs4	4-5	h	l-gsl	1WA	1Dv	S2	3(6)T4(4)TM	D3	1C1-N	2	3	W2K	G2	270.1
129	OxWs14	4-3	h	l-sl	1MP	2Dsv	S2	3(6)MT4(2)M5(2)W	D3	3S2-N	2	2	W2K	G2	299.9
130	OxWh2	5-4	h	l	1MP	2Cst2v	S2	4(5)T3(3)T6(2)W	D3	3E3-N,2S2-N	2	4	W1K	SG0	417.8
131	OxWh2	4-5	h	l	1WP	1Dv	S2	3(4)T4(3)T5(3)WT	D3	3C2-N,2S2-N	2	2	W1K	SG0	981.4
132	Wz1	1	l	U	1WP	4Cwi	U	5(10)W	U	6S6-N	U	U	U	G4	74.3
133	Sf11	3	h	l-sl	2MP	4Dmv	S2	3(6)MP6(4)W	D1	4S3-N,3O4-N	2	2	W1K	SG1	302.2
134	OxWs10	3-4	h	l-gsl	1MP	2Dsv	S1	2(4)M3(3)TM4(3)MW	D3	2C1-N	2	2	W2K	G2	304.6
135	WvWh1	4-5	hd	l	1WP	2Cdt2v	S2	3(4)T4(4)T5(2)TW	D3	2C1-N	2	3D	W1G	SG0	427.9

Area No.	Map Unit	Slope Class	Land Form	Surface Texture	Salinity	Irrigation	Stone Class	Agricultural Capability	pH	Wetlands Classification	Wind Eros.	Water Eros.	Past Eros.	Sand/Gravel	Acreage (ac)
136	Michel Lake									6L6-N					46.9
137	Ox8	4-3	h	l-cl	1MP	2Cst2v	S2	3(5)T2(3)MT5(2)W	D3	3S3-N,2C2-N	2	3	W1K	SG1	640.3
138	Ox8	4-3	h	l-cl	1MP	2Cst2v	S2	3(5)T2(3)MT5(2)W	D3	3S3-N,2C2-N	2	3	W1K	SG1	4397.8
139	Ox11	4-5	h	l	1MP	2Cst2v	S2	3(4)T4(4)T5(2)W	D3	3S3-N,2C2-N	2	3	W2K	SG1	292.0
140	Ox11	4-5	h	l	1MP	2Cst2v	S2	3(4)T4(4)T5(2)W	D3	3S3-N,2C2-N	2	3	W2K	SG1	379.0
141	OxHd15	3-5	h	l-cl	2MP	3Dst2v	S1	4(4)T2(3)MT5(3)W	D3	4O3-N,2C2-N	2	3	W2K	SG0	296.2
142	WsOx7	4-5	h	gl-l	0	3Dmv	S2	3(6)MT4(4)T	D3	N	3	2	W3K	G3	75.1
143	Ox11	3-4	h	l	2MP	3Cst2v	S1	2(5)M3(3)T5(2)W	D3	3O3-N,2C2-N	2	2	W1K	SG1	1020.8
144	OxWs10	4-5	h	l-gl	1MP	2Dsv	S2	3(6)TM4(3)T5(1)W	D3	2S2-N,2C2-N	2	3	W2K	G2	199.8
145	Ws11	3	hd	gl	1MP	4Bmt2v	S2	3(9)M5(1)W	D3	2S3-N,1C2-N	3	2D	W1K	G4	97.0
146	Ox8	4-3	h	l-cl	1MP	2Cst2v	S2	3(5)T2(3)MT5(2)W	D3	3S3-N,2C2-N	2	3	W1K	SG1	444.0
147	Ox8	4-3	h	l-cl	1MP	2Cst2v	S2	3(5)T2(3)MT5(2)W	D3	3S3-N,2C2-N	2	3	W1K	SG1	100.2
148	Ox19	5-6	hd	l	1MP	2Dst2	S2	4(6)T5(3)T6(1)W	D3	3S2-N	2	4D	W3KG	SG0	754.4
149	Ox19	5-6	hd	l	1MP	2Dst2	S2	4(6)T5(3)T6(1)W	D3	3S2-N	2	4D	W3KG	SG0	108.0
150	Ox19	5-6	hd	l	1MP	2Dst2	S2	4(6)T5(3)T6(1)W	D3	3S2-N	2	4D	W3KG	SG0	49.3
151	Ox19	5-6	hd	l	1MP	2Dst2	S2	4(6)T5(3)T6(1)W	D3	3S2-N	2	4D	W3KG	SG0	25.5
152	Sl2	4-3	hd	l-sl	1WP	4Dmv	S2	4(6)P5(4)W	D3	3S2-N,2W2-N	3	2D	W3K	SG1	8.6
153	Sl2	4-3	hd	l-sl	1WP	4Dmv	S2	4(6)P5(4)W	D3	3S2-N,2W2-N	3	2D	W3K	SG1	1055.7
154	Ws11	3-4	h	gl	1MP	4Cmt2	S2	3(9)M5(1)W	D3	3S2-N	4	2	W1K	G4	150.6
155	Ws11	3-4	h	gl	1MP	4Cmt2	S2	3(9)M5(1)W	D3	3S2-N	3	2	W1K	G4	71.0
156	Ws11	3-4	h	gl	1MP	4Cmt2	S2	3(9)M5(1)W	D3	3S2-N	3	2	W1K	G4	146.4
157	Ox11	5-6	h	l	2MP	3Dst2v	S2	4(5)T6(3)W5(2)T	D3	4O3-N	2	4	W2K	SG0	114.1
158	Gn2	4-5	h	l-cl	1MP	2Cst2v	S2	3(5)T4(3)T5(2)W	D3	2O2-N,2C2-N	2	3	W2K	SG0	1428.5
159	Ox2	4-5	h	l-cl	1MP	2Cst2v	S1	3(5)T4(3)T5(2)W	D3	3S2-N,2C1-N	2	2	W3K	SG0	1289.2
160	OxHd15	3-4	h	l	1MP	2Cst2v	S1	2(6)M3(2)T5(2)W	D3	3S3-N,2C2-N	2	2	W1K	SG0	223.6
161	HdOx12	3-4	h	l-cl	1MP	2Cst2v	S1	2(6)MT3(2)T5(2)W	D3	3S3-N,2C2-N	2	2	W1K	SG0	495.9
162	Ox11	4-5	h	l	1MP	2Cst2v	S2	3(5)T4(3)T5(2)W	D3	3S3-N,2C2-N	2	3	W2K	SG1	168.2
163	Ox8	4-3	h	l	1MP	2Cst2v	S2	3(5)T2(3)M5(2)W	D3	3S3-N,2C2-N	2	3	W1K	SG1	395.2
164	Gn3	4-3	h	l-cl	1MP	2Cst2v	S2	3(5)T2(3)MT5(2)W	D3	3S2-N,2C2-N	2	3	W1K	SG0	2050.2
165	Ox8	3-4	h	l-cl	1MP	2Cst2v	S2	2(5)MT3(3)T5(2)W	D3	3S1-N,2C1-N	2	2	W2K	SG0	456.2
166	Ox8	3-4	h	l-cl	1MP	2Cst2v	S2	2(5)MT3(3)T5(2)W	D3	3S1-N,2C1-N	2	2	W2K	SG0	5935.2
167	Ox8	4-3	h	l	1MP	2Cst2v	S2	3(5)T2(3)M5(2)W	D3	3S3-N,2C2-N	2	3	W1K	SG1	338.5
168	Ox11	3-5	h	l	2MP	3Dst2v	S1	3(5)T4(2)T5(3)WT	D3	4S3-N,2C2-N	2	3	W2KG	SG1	151.8
169	Ox11	4-5	h	l	2MP	3Dsv	S2	3(5)T4(3)TW6(2)W	D3	4O3-N,2C2-N	2	3	W2K	SG1	104.2
170	Ox11	4-6	h	l	1MP	2Dst2v	S1	3(3)T4(2)T6(5)WT	D3	4O3-N,2C2-N	2	4	W2G	SG1	78.9
171	Ox8	3-4	h	l	1MP	2Cst2v	S2	2(6)M3(2)T5(2)W	D3	3O2-N,2C2-N	2	2	W1K	SG1	3563.0
172	Ox11	4-5	h	l	1MP	2Dsv	S1	3(4)T4(3)T6(3)W	D3	4O3-N,2C2-N	2	3	W2K	SG0	178.4
173	Ox11	4-5	h	l	2WPA	2Cst2v	S2	3(5)T4(3)T6(2)W	D3	3E2-N,2W2-N	2	2	W3K	SG0	537.8
174	Ox11	4-3	h	l	2MP	3Cst2v	S2	3(5)T2(3)M5(2)W	D3	3S3-N,2C2-N	2	3	W2K	SG1	756.6
175	Ox11	4-5	h	l	2MP	3Cst2v	S2	3(5)T4(3)TE6(2)W	D3	3O3-N,2C2-N	2	3	W2K	SG1	1113.5
176	OxHd15	3	h	l	1MP	2Csv	S1	2(8)M5(2)W	D3	3S2-N,2C2-N	2	2	W1K	SG0	431.0
177	OxWs11	3-4	h	l-gl	1WA	1Dv	S2	2(5)M3(3)MT5(2)W	D3	3W2-N,2C2-N	2	2	W2K	G2	291.7
178	Ox11	3	h	l	2MPA	3Csv	S1	2(8)M5(2)W	D3	3W2-N,2C2-N	2	2	W1K	SG0	617.4
179	Ox11	3-5	h	l	2WPA	2Dst2	S2	3(5)T2(3)M6(2)W	D3	3E2-N,2W2-N	2	2	W3K	SG0	186.7
180	Ox11	3-5	h	l	2WPA	2Dst2	S2	3(5)T2(3)M6(2)W	D3	3E2-N,2W2-N	2	2	W3K	SG0	285.2
181	Ox11	3-5	h	l	2WPA	2Dst2	S2	3(5)T2(3)M6(2)W	D3	3E2-N,2W2-N	2	2	W3K	SG0	858.1
182	Ox8	3	h	l	1WPA	1Cv	S1	2(8)M5(2)W	D3	3W2-N,2C2-N	2	2	W1K	SG0	823.2
183	Ox11	4-3	h	l	1WP	1Ci2v	S2	3(5)T2(3)M5(2)W	D3	3W2-N,2C2-N	2	2	W2K	SG0	440.3
184	OxWh4	3-4	h	l	1WP	1Ci2	S2	2(6)M3(3)T5(1)W	D3	2S2-N,1C2-N	2	2	W2K	SG0	129.3
185	OxNc2	3-5	h	l-sil	1WP	1Di2	S2	2(6)MT4(2)T5(2)W	D3	3S2-N,2C2-N	2	2	W3KG	SG0	315.2
186	OxWs10	4-3	h	l-gl	2WPA	2Dsv	S2	3(6)TM2(3)M6(1)W	D3	2E2-N,1C2-N	2	2	W3K	G2	424.5
187	Ox11	4-3	h	l	1WP	1Ci2v	S1	3(5)T2(3)M5(2)W	D3	3S2-N,2C2-N	2	2	W2K	SG0	300.5
188	Ox11	3-5	h	l	2MPA	3Dst2v	S2	2(5)M3(2)T6(3)W	D3	3E3-N,2S2-N	2	2	W3K	SG0	261.6
189	OxWs11	3-4	h	l-gsl	2WPA	2Dsv	S2	2(5)M4(3)M5(2)W	D3	3W2-N,2C2-N	2	2	W2K	G2	563.5
190	Ox8	3-4	h	l	2WP	2Cst2v	S2	2(5)M3(3)T6(2)W	D3	3S2-N,2E2-N	2	2	W2K	SG0	550.3
191	Ox8	3-4	h	l	2WP	2Cst2v	S2	2(5)M3(3)T6(2)W	D3	3S2-N,2E2-N	2	2	W2K	SG0	174.0
192	Ox11	4-3	h	l	2WPA	2Cst2v	S2	3(5)T2(3)M5(2)W	D3	3W3-N,2C2-N	2	2	W2K	SG0	562.3
193	Ox11	4-3	h	l	2WPA	2Cst2v	S2	3(5)T2(3)M5(2)W	D3	3W2-N,2C2-N	2	2	W2K	SG0	806.3
194	Ox8	4-3	h	l	2WP	2Cst2v	S2	3(5)T2(3)M6(2)W	D3	3S2-N,2E2-N	2	2	W2K	SG0	5273.0
195	Ox8	3-4	h	l	2WPA	2Cst2v	S2	2(5)M3(3)T6(2)W	D3	3E2-N,2C2-N	2	2	W2K	SG1	1629.8
196	OxWs11	4-3	h	l-gl	1WP	1Dv	S2	3(5)TM2(3)M5(2)W	D3	3W2-N,2C2-N	2	2	W3K	G2	170.8
197	Ox11	3-5	h	l	2MPA	3Dst2v	S2	3(5)T4(2)T6(3)W	D3	3E3-N,3W2-N	2	3	W3K	SG0	313.7
198	Ox8	3-4	h	l	1WP	1Ci2v	S2	2(5)M3(3)T5(2)W	D3	3S2-N,2C2-N	2	2	W2K	SG0	1640.6
199	Ox8	4-5	h	l	2MPA	3Dsv	S2	3(4)T4(3)TW6(3)W	D3	3O3-N,3S2-N	2	3	W3K	SG1	765.1
200	Ox11	4-3	h	l	1MPA	2Cst2v	S2	3(5)T2(3)M5(2)W	D3	3S2-N,3C1-N	2	2	W3K	SG1	437.8
201	Wz2	1	l	U	4MPA	4Cwi	U	6(6)W5(4)NW	U	5E6-N,4C3-N	U	U	U	G2	118.1
202	OxWs8	4-5	hr	l-gsl	1MPA	2Dsv	S2	3(5)TP4(3)TM5(2)W	D3	3S2-N,2O2-N	2	2	W3K	G2	1560.9
203	Wn4	3-4	h	sl-gsl	2MPA	3Dmsv	S2	3(4)MP4(4)MW5(2)W	D3	3S1-N,2O2-N	3	1	W2K	SG1	501.5
204	Ox11	3-4	h	l	2MPA	3Dsv	S2	2(6)M3(2)TW5(2)W	D3	3S1-N,3C1-N	2	2	W2K	SG1	3548.8
205	Ox8	4-5	h	l	1MPA	2Dsv	S2	3(6)T4(3)TW5(1)W	D3	3C1-N,2O3-N	2	2	W4KG	SG1	210.7

Area No.	Map Unit	Slope Class	Land Form	Surface Texture	Salinity	Irrigation	Stone Class	Agricultural Capability	pH	Wetlands Classification	Wind Eros.	Water Eros.	Past Eros.	Sand/Gravel	Acreage (ac)
206	Ox8	4-5	h		1MPA	2Dsv	S2	3(6)T4(3)TW5(1)W	D3	3C1-N,2O3-N	2	2	W4KG	SG1	252.5
207	Ox8	4-6	h	sl	1MPA	2Dst2v	S2	3(4)TP4(3)T5(3)WT	D3	3S2-N,2O3-N	2	4	W4K	SG1	1245.7
208	Ox11	4-3	h		1MPA	2Dsv	S2	3(5)TW2(3)M5(2)W	D3	3S2-N,3C1-N	2	2	W3K	SG1	1656.2
209	OxWs11	4-3	h	gsi	2MPA	3Dsv	S2	3(6)TP4(2)M5(2)W	D3	3S2-N,2O2-N	2	2	W3K	G2	522.0
210	Wz3	1	l	U	1MP	4Cwi	U	7(10)W	U	6P6-N	U	U	U	SG0	90.2
211	Wz3	1	l	U	1MP	4Cwi	U	7(10)W	U	6P6-N	U	U	U	SG0	115.8
212	Ox8	3-5	h		1MPA	2Dst2	S2	3(5)TP2(3)M5(2)W	D3	3O3-N,3S2-N	2	3	W3K	SG1	3310.5
213	Ox8	4-5	h		1MP	2Cst2v	S2	3(6)TP4(2)T5(2)W	D3	3O2-N,3C2-N	2	3	W3K	SG1	8126.8
214	Ox8	4-3	h		1MPA	2Cst2v	S2	3(5)TP2(3)M5(2)W	D2	3O2-N,3S2-N	2	2	W2K	SG1	600.8
215	OxWs8	4-3	h	gl	2MPA	3Dsv	S2	3(6)TM2(1)M5(3)W	D2	3O2-N,2C2-N	2	3	W3K	G2	1332.5
216	Ox11	4-3	h		2MPA	3Cst2v	S2	2(4)M3(4)TP5(2)W	D3	3O2-N,3S2-N	2	2	W3K	SG1	1717.5
217	OxWs11	3-4	h	gl	1MPA	2Dsv	S2	2(6)M3(2)MW5(2)W	D2	3S2-N,3C1-N	2	2	W2K	G2	1117.4
218	OxWs11	4-3	h	gsi	2MPA	3Dsv	S2	3(5)TP4(3)MW5(2)W	D2	3S1-N,2O2-N	2	2	W4K	G2	828.4
219	WsOx8	3	u	gsi-sl	2MPA	3Dmsv	S2	4(5)M3(3)M5(2)W	D2	3O2-N,2S1-N	3	1	W1K	G3	181.0
220	Ox8	4-5	h		1MP	2Dsv	S2	3(5)T4(2)T5(3)W	D2	4O4-N,2C2-N	2	3	W1K	SG1	565.7
221	Ox8	4-5	h		1MP	2Dsv	S2	3(5)T4(2)T5(3)W	D2	4O4-N,2C2-N	2	3	W1K	SG1	247.6
222	Ox8	4-5	h		1MP	2Dsv	S2	3(5)T4(2)T5(3)W	D2	4O4-N,2C2-N	2	3	W1K	SG1	197.1
223	Ox4	5-6	hd		0	1Dt2	S2	4(7)TE5(3)TE	D3	N	2	4D	W3K	SG1	177.1
224	Ox12	3	h		3MP	4Dsv	S2	2(6)M3(1)N5(3)W	D2	4O3-N,2C2-N	2	2	W1K	SG1	206.0
225	Ox8	4-3	h		1MP	2Cst2v	S2	2(4)M3(4)T5(2)W	D2	3S2-N,2C2-N	2	3	W2K	SG1	5803.9
226	Ox8	4-5	h		1MP	2Dsv	S2	3(5)T4(2)T5(3)W	D3	4O4-N,2C2-N	2	3	W1K	SG1	57.1
227	Wz3	1	l	U	1MP	4Cwi	U	7(10)W	U	6O5-N	U	U	U	G2	33.4
228	Ox4	5-7	hd		0	1Dt2	S2	4(6)T5(2)T6(2)T	D2	1S2-N	2	5D	W2KG	SG0	265.8
229	Ox4	4-6	h		1MP	2Dst2v	S2	3(5)T4(2)T5(3)TW	D2	2S2-N	2	4	W2K	SG1	260.8
230	Ox8	3-4	h		1MP	2Cst2v	S2	2(6)M3(2)T5(2)W	D2	3S2-N,2C2-N	2	2	W1K	SG1	583.6
231	Ox8	4-3	h		1MP	2Cst2v	S2	2(4)M3(4)T5(2)W	D2	3S2-N,2C2-N	2	3	W2K	SG1	362.2
232	Ox4	5-6	h		1MP	2Dst2v	S2	4(7)T5(3)TW	D3	3O2-N	2	3	W2K	SG1	121.9
233	Ox12	3-4	h		3MP	4Dsv	S2	2(4)M3(3)TN6(3)W	D3	4O3-N,2C2-N	2	2	W1K	SG0	101.2
234	Ox8	4	h		1WP	1Ct2v	S2	3(8)T5(2)W	D3	3O2-N,2S2-N	2	2	W2K	SG0	11.3
235	Ox8	4	h		1WP	1Ct2v	S2	3(8)T5(2)W	D3	3O2-N,2S2-N	2	3	W2K	SG0	226.6
236	Ox8	4-3	h		1MP	2Cst2v	S2	3(5)T2(3)M5(2)W	D2	3S2-N,2C2-N	2	3	W1K	SG1	834.9
237	Ox8	4-3	h		1WP	1Ct2v	S2	3(5)T2(3)M5(2)W	D2	3S2-N,2C1-N	2	2	W2K	SG0	51.1
238	Ox8	3-4	h	cl	1WP	1Ct2v	S2	2(5)M3(3)T5(2)W	D2	3S2-N,2C2-N	2	2	W1K	SG1	2456.2
239	Rw	4	id		1WP	4Dct2	S2	5(10)EW	D3	4S3-N,3E2-N	2	4D	U	SG0	16.5
240	Rw	4	id		1WP	4Dct2	S2	5(10)EW	D3	4S3-N,3E2-N	2	4D	U	SG0	4.2
241	Rw	4	id		1WP	4Dct2	S2	5(10)EW	D3	4S3-N,3E2-N	2	4D	U	SG0	18.4
242	Ox11	5-6	h		1MP	2Dst2v	S2	4(5)T5(5)TW	D3	2S2-N,2C2-N	2	4	W3K	SG1	89.6
243	Ox8	3-4	h	cl	1WP	1Ct2v	S2	2(5)M3(3)T5(2)W	D2	3S2-N,2C2-N	2	2	W1K	SG1	2.5
244	Ox8	4-3	h		1WP	1Ct2v	S2	3(5)T2(3)M5(2)W	D3	3S2-N,2C1-N	2	2	W2K	SG0	53.1
245	OxWs10	5-6	h	gl	0	1Dvt2	S3	4(7)TP5(3)TP	D3	1S1-N,1C1-N	3	4	W3K	G2	71.2
246	Ox8	4-5	h		1MP	2Cst2v	S2	3(4)T4(4)T5(2)W	D2	3S2-N,2C2-N	2	3	W2K	SG1	2029.2
247	Ox11	4-5	h	cl	1WP	1Ct2v	S2	3(5)T4(3)TE5(2)W	D3	3O3-N,2S2-N	2	3	W3K	SG0	506.6
248	Ox11	3-4	h		1WP	1Ct2v	S2	2(5)M3(3)T5(2)W	D3	3S2-N,2C2-N	2	2	W2K	SG0	143.6
249	Wn2	4-5	h	sl	1WP	3Dmv	S2	3(5)MT4(3)TE5(2)W	D3	3S2-N,2C2-N	2	2	W4K	SG1	163.5
250	Wn4	3-4	h	sl	1WP	3Dmv	S2	2(4)M3(4)MT5(2)W	D3	3S2-N,2C2-N	2	2	W2K	SG1	189.8
251	Ox8	4-5	h		1WP	1Ct2v	S2	3(5)T4(3)TE5(2)W	D3	3S2-N,2C2-N	2	2	W4K	SG0	177.3
252	Wn2	4	h	sl	1WP	3Dmv	S2	3(8)MT5(2)W	D3	3S2-N,2C2-N	3	2	W3K	SG1	174.4
253	OxHd2	3-4	h		1WP	1Ct2v	S2	2(5)M3(3)T5(2)W	D3	3S2-N,2C2-N	2	2	W2K	SG0	183.8
254	Ox11	4-5	h		1WP	1Ct2v	S2	3(5)T4(3)TE5(2)W	D3	3S2-N,2C2-N	2	2	W3K	SG0	213.9
255	OxWh2	4-3	h		1WP	1Ct2v	S1	3(5)T2(3)M5(2)W	D3	3W2-N,2C2-N	2	2	W2K	SG0	416.7
256	OxNc2	3	h	sil	2WPA	2Csv	S1	2(8)MT6(2)W	D3	3O2-N,2C2-N	2	2	W1K	SG0	508.6
257	Ox22	5-6	h		1WP	1Dt2	S2	5(4)TE6(2)W4(4)T	D3	3S2-N,2C2-N	2	3	W4K	SG0	912.9
258	MwOx1	3	u		2WP	4Cwi	S2	6(4)W5(3)W2(3)M	D3	4S3-N,4W3-N	2	2	W1K	SG0	78.5
259	Ox11	3-4	h		2WP	2Cst2v	S2	2(5)M3(3)T5(2)W	D3	3S2-N,2W2-N	2	2	W2K	SG0	68.3
260	Ox8	4-5	h		1MP	2Cst2v	S2	3(4)T4(4)T5(2)W	D3	3S3-N,2C2-N	2	3	W2K	SG1	2328.1
261	Ox8	3-4	h		1WP	1Ct2v	S2	2(5)M3(3)T6(2)W	D3	3S2-N,2E2-N	2	2	W2K	SG0	2307.6
262	Ox18	3	u		1WPA	1Dv	S2	2(6)M5(2)W6(2)W	D3	4S2-N,2C2-N	2	2	W1K	SG0	78.0
263	Gn8	3-4	h	cl	1WP	1Ct2v	S2	2(5)MT3(3)T5(2)W	D3	3S2-N,2C2-N	2	2	W2K	SG0	114.6
264	MwOx1	3-2	u		1WPA	4Cwi	S2	6(4)W5(2)W2(4)M	D3	4E3-N,3S2-N	2	2	W1K	SG0	163.1
265	Ox11	3-2	u		1WPA	1Dv	S1	2(7)M6(2)W5(1)W	D3	4S3-N,2C2-N	2	2	W1K	SG0	145.9
266	Ox11	3-2	u		1WPA	1Dv	S1	2(7)M6(2)W5(1)W	D3	4S3-N,2C2-N	2	2	W1K	SG0	136.5
267	Ox22	5-4	h		1WP	1Ct2v	S2	4(5)TE3(3)T5(2)W	D3	3S2-N,2C2-N	2	3	W4KG	SG0	1911.3
268	OxWs10	4-5	h	gl	1WP	1Dv	S2	3(6)TM4(4)T	D3	1C2-N	2	2	W3K	G2	96.7
269	Ox8	3-4	h		2WP	2Cst2v	S2	2(5)M3(3)T6(2)W	D3	3E2-N,2C2-N	2	2	W2K	SG1	2942.7
270	Ox22	5-4	h		1WP	1Ct2v	S2	4(5)TE3(3)T5(2)W	D3	3S2-N,2C2-N	2	3	W4KG	SG0	52.2
271	Ox19	5-4	h		1WPA	1Ct2	S2	4(5)TE3(4)T5(1)W	D3	1S2-N,1C2-N	2	4	W4K	SG0	383.8
272	Rw	4-3	hd		1WPA	4Dct2	S2	4(4)TP3(3)T5(3)W	D3	3E2-N,2W2-N	2	3D	W2G	SG0	213.7
273	MeWs13	5-4	h	sl-gl	1WA	2Cmt2	S2	4(5)T3(2)M5(3)E	D3	N	4	4	W4K	SG4	82.5
274	OxHd7	3-4	h		1WPA	1Ct2	S2	2(7)M3(2)T5(1)W	D3	2C1-N	2	2	W2K	SG1	583.8
275	Ox8	4-3	h		2WP	2Cst2v	S2	3(5)T2(3)M6(2)W	D3	3S2-N,2E2-N	2	2	W2K	SG0	1084.2

Area No.	Map Unit	Slope Class	Land Form	Surface Texture	Salinity	Irrigation	Stone Class	Agricultural Capability	pH	Wetlands Classification	Wind Eros.	Water Eros.	Past Eros.	Sand/Gravel	Acreeage (ac)
276	Ox11	4-5	h		1WP	1Ct2v	S2	3(5)T4(3)TE5(2)W	D3	3S2-N,2C2-N	2	2	W3K	SG0	13.0
277	OxHd2	4	h		1WP	1Ct2v	S2	3(8)T5(2)W	D3	3S2-N,2C2-N	2	2	W2K	SG0	39.2
278	OxHd2	4	h		1WP	1Ct2v	S2	3(8)T5(2)W	D3	3S2-N,2C2-N	2	2	W2K	SG0	91.3
279	Ox11	3-4	h		1WP	1Ct2v	S2	2(5)M3(3)T5(2)W	D3	3S2-N,2C2-N	2	2	W2K	SG0	140.8
280	OxHd2	3-4	h		1WP	1Ct2v	S2	2(5)M3(3)T5(2)W	D3	2E2-N,1C2-N	2	2	W2K	SG0	27.0
281	Ox8	4-5	h		2WPA	2Cst2v	S2	3(5)T4(3)T6(2)W	D3	3E2-N,2C2-N	2	2	W3K	SG0	463.5
282	Ox8	4-3	h		2WP	2Cst2v	S2	3(5)T2(3)M6(2)W	D3	3S2-N,2E2-N	2	2	W2K	SG0	53.7
283	Ox10	5-4	h		1WP	1Ct2	S2	4(5)TE3(4)T6(1)W	D3	2E2-N,1C2-N	2	3	W4KG	SG0	411.9
284	MwOx1	3-2	u		2MPA	4Cwi	S1	5(5)W6(2)W2(3)M	D3	5S5-N,3E2-N	2	2	W1K	SG0	58.7
285	Ox7	3	h		1WA	1Bt2v	S1	2(9)M4(1)W	D3	2S2-N	2	2	W1K	SG0	186.4
286	MwOx1	3-5	h		2MA	4Cwi	S2	6(4)W5(3)W4(3)T	D3	4E5-N,4C5-N	2	2	W4K	SG0	256.8
287	Ox8	4-3	h		2WP	2Cst2v	S2	3(5)T2(3)M6(2)W	D3	3S2-N,2E2-N	2	2	W2K	SG0	244.9
288	HdOx11	3	h	sid	2WPA	2Cqsv	S1	2(8)T5(2)W	D3	3W2-N,2C2-N	2	2	W1K	SG0	114.9
289	Ox8	3-4	h	l-cl	1MP	2Cst2v	S2	2(5)MT3(3)T5(2)W	D3	3S1-N,2C1-N	2	2	W2K	SG0	133.6
290	OxWs8	4-5	h	l-gsl	1WP	1Dv	S2	4(5)TM3(3)T5(2)W	D3	3S1-N	2	2	W2K	G2	295.1
291	Ox2	4-6	h		1MP	2Dst2v	S2	3(4)T4(3)T5(3)TW	D3	2S1-N,2C1-N	2	4	W3K	SG0	625.3
292	Ox20	3-2	h		4MA	4Dsv	S1	5(6)NW2(4)M	D3	4S3-N	2	2	W1K	SG0	109.5
293	Ox8	3-4	h		1MP	2Cst2v	S2	2(5)M3(3)T5(2)W	D3	3S2-N,2C1-N	2	2	W2K	SG0	860.8
294	Ox2	4-5	h		2MP	3Cst2v	S2	3(5)T4(3)T5(2)W	D3	3S3-N,2C1-N	2	2	W2K	SG0	853.6
295	OxHd2	3	h	l-cl	1MPA	2Csv	S1	2(8)MT5(2)W	D2	3S2-N,1C1-N	2	2	W2K	SG0	360.3
296	Gn8	4-5	h	l-cl	1MP	2Cst2v	S2	3(5)T4(3)T5(2)W	D3	2S1-N,2C1-N	2	2	W3K	SG0	393.2
297	Sf1	4	hd	l-sl	1WP	4Dmv	S2	5(6)EW3(4)MT	D1	3S2-N	2	2D	W1K	SG1	542.4
298	Ox8	4-3	h	l-cl	1WP	1Ct2v	S2	3(5)T2(3)M5(2)W	D3	3S2-N,2C1-N	2	2	W2K	SG0	2287.4
299	Ox8	5-4	h		1WP	1Ct2v	S2	4(5)TE3(3)T5(2)W	D3	3S2-N,2C1-N	2	3	W2K	SG0	193.2
300	Ox8	5-4	h		1WP	1Ct2v	S2	4(5)TE3(3)T5(2)W	D3	3S2-N,2C1-N	2	3	W2K	SG0	70.1
301	OxHd2	4-3	h	l-cl	1MP	2Cst2v	S2	3(5)T2(3)M5(2)W	D2	3S1-N,2C1-N	2	2	W2K	SG0	238.6
302	OxWs8	4-3	h	l-gsl	1MP	2Dsv	S2	3(4)T4(4)MW2(2)M	D2	3S1-N	2	2	W2K	G2	789.9
303	OxHd2	3-4	h	l-cl	1MP	2Cst2v	S1	2(5)MT3(3)T5(2)W	D2	3S1-N,2C1-N	2	2	W1K	SG0	286.9
304	Ox8	4-3	h		1MP	2Cst2v	S1	3(5)T2(3)M5(2)W	D3	3S2-N,2C1-N	2	2	W2K	SG0	2153.6
305	OxWs8	4-5	hr	l-gsl	2MP	3Dsv	S2	3(4)TP4(4)TM5(2)W	D3	3S1-N,2C1-N	2	2	W2K	G2	517.8
306	Ox2	4-5	hr		1MP	2Cst2v	S2	3(5)T4(3)T5(2)W	D3	3S1-N,1O3-N	2	2	W2K	SG0	476.6
307	Ox22	5-6	h		2MP	3Dst2v	S2	4(6)T5(4)TW	D3	3S2-N	2	4	W2K	SG0	56.4
308	Ox22	5-6	h		2MP	3Dst2v	S2	4(6)T5(4)TW	D3	3S2-N	2	4	W2K	SG0	123.9
309	Gn3	3-4	h	l-cl	1MP	2Cst2v	S2	2(5)MT3(3)T5(2)W	D2	2S1-N,2C1-N	2	2	W2K	SG0	426.7
310	OxHd8	3-4	h	l-cl	1MP	2Cst2v	S1	2(5)MT3(3)T5(2)W	D2	3C1-N	2	2	W2K	SG0	77.7
311	Ws4	6-5	hr	gsl	1WA	4Dmt2	S1	5(7)T4(3)M	D3	N	4	4	W2K	G4	144.9
312	Rw	4-6	hd	l-gsl	1MD	4Dct2	S2	4(4)TM3(3)T5(3)TW	D3	3C1-N,2S2-N	2	5D	W2K	SG1	76.8
313	Ox4	5-6	h		1MP	2Dst2v	S2	4(6)TE5(4)TW	D3	2C1-N,1O3-N	2	4	W3K	SG0	245.1
314	Ox2	4-5	h	l-cl	1MP	2Cst2v	S2	3(5)T4(3)T5(2)W	D3	3S1-N,2C1-N	2	2	W3K	SG0	667.9
315	Ws4	3	t	gls-gsl	1WA	4Bmt2v	S2	4(10)M	D3	N	4	1	W1K	G4	52.8
316	Ws4	3	t	gls-gsl	1WA	4Bmt2v	S2	4(10)M	D3	N	4	1	W1K	G4	61.3
317	Ws4	3	t	gls-gsl	1WA	4Bmt2v	S2	4(10)M	D3	N	4	1	W1K	G4	51.4
318	Ws4	3	t	gls-gsl	1WA	4Bmt2v	S2	4(10)M	D3	N	4	1	W1K	G4	56.1
319	Ox19	6-5	id		0	1D12	S2	5(7)T4(3)TE	D3	N	2	5D	W3G	SG1	101.0
320	Ox19	6-5	id		0	1D12	S2	5(7)T4(3)TE	D3	N	2	5D	W3G	SG1	29.0
321	Ox2	4-3	h		1MP	2Cst2v	S2	3(5)T2(3)M5(2)W	D3	3S1-N,2C1-N	2	2	W2K	SG0	322.3
322	Ox19	5-6	hid	l-cl	0	1D12	S2	4(6)TE5(4)T	D3	N	2	4D	W3G	SG0	59.5
323	Ox22	5	h		1WP	1Ct2v	S1	4(8)T5(2)W	D3	3S1-N	2	3	W3K	SG0	95.8
324	Ox8	3-4	h	l-cl	1MP	2Cst2v	S2	2(5)MT3(3)T5(2)W	D3	3S1-N,2C1-N	2	2	W2K	SG0	864.9
325	Ox19	6-5	id		0	1D12	S2	5(7)T4(3)TE	D3	N	2	5D	W3G	SG1	126.5
326	Ox4	4-5	h	l-cl	1WA	1Ct2	S2	3(6)TE4(3)T5(1)W	D3	1S1-N,1C1-N	2	2	W3K	SG0	131.9
327	Hw	6-5	ig	l-cl	0	4Dct2	S2	6(7)TE5(3)TE	D3	N	2	5G	W3K	SG1	25.3
328	Hw	6-5	ig	l-cl	0	4Dct2	S2	6(7)TE5(3)TE	D3	N	2	5G	W3K	SG1	8.5
329	Hw	6-5	ig	l-cl	0	4Dct2	S2	6(7)TE5(3)TE	D3	N	2	5G	W3K	SG1	4.5
330	Ox2	4-5	h	l-cl	1MP	2Cst2v	S2	3(5)T4(3)T5(2)W	D3	2S1-N,2C1-N	2	2	W3K	SG0	34.6
331	Hw	6	ig	l-sl	0	4Dct2	S2	6(10)TE	D3	N	2	5G	W3G	SG0	57.0
332	OxHd4	3-4	h	l-cl	1MP	2Cst2	S1	2(7)MT3(2)T5(1)W	D2	2C2-N,1S2-N	2	2	W2K	SG0	285.2
333	Gn2	5-4	h	l-sicl	1WP	1Ct2v	S2	4(5)TE3(3)T5(2)W	D2	3S2-N,2C1-N	2	3	W2K	SG0	2486.1
334	Gn2	5-4	h	l-sicl	1WP	1Ct2v	S2	4(5)TE3(3)T5(2)W	D2	3S2-N,2C1-N	2	3	W2K	SG0	99.3
335	Wn4	4-5	h	l-sl	1MP	3Dmv	S2	3(5)MT4(3)TE5(2)W	D3	3S2-N,2C1-N	2	2	W3K	SG1	917.7
336	OxWh2	4-5	h		1MP	2Cst2v	S2	3(6)T4(2)T5(2)W	D2	2S2-N,2C1-N	2	2	W2K	SG1	2243.2
337	Sf2	4-3	hd	l-sl	1WP	4Dmv	S2	5(10)TW	D2	3S2-N	3	2D	U	SG1	92.8

7. GLOSSARY

- Acid soil** - A soil having a pH of less than 7.0.
- Aggregate** - A group of soil particles sticking together in such a way that they behave mechanically as a unit.
- Alkali soil** - (i) A soil having a high degree of alkalinity (pH of 8.5 or higher), or having a high exchangeable sodium content (15% or more of the exchange capacity), or both. (ii) A soil that contains enough alkali (sodium) to interfere with the growth of most crops.
- Note:** The term "alkali soil" is often incorrectly used to describe "saline soil".
- Alkaline soil** - A soil having a pH greater than 7.0.
- Alluvial deposit** - Refer to section "2.3 Surface Deposits" on page 2-1 of this report.
- Apron** - Refer to section "2.4 Surface Forms" on page 2-2 of this report.
- Aspect** - The particular direction in which a slope faces.
- Available water** - The portion of water in a soil that can be readily absorbed by plant roots. See also "field capacity".
- Bedrock** - The preglacial sediments, exclusive of stratified deposits in preglacial valleys, that underlie the surficial glacial sediments. These bedrock materials may or may not be consolidated into solid rock and may be exposed at the surface.
- Blanket** - A mantle of unconsolidated materials thick enough to mask minor irregularities in the underlying unit but still conforming to the general underlying topography.
- Blowout** - A small area from which soil material has been removed by wind.
- Channel** - The bed where a natural stream of water runs or has run.
- Clay** - (i) A soil particle that is less than 0.002 mm in diameter. (ii) A soil textural class. See also "texture, soil".
- Clod** - A compact, coherent mass of soil varying in size, usually produced by plowing or digging.
- Cobble** - Rounded or partially rounded rock or mineral fragment between 8 and 25 cm in diameter.
- Cobbly** - Containing appreciable quantities of cobbles. The term is used to describe both soil and land.
- Colluvium** - A heterogeneous mixture of material that has moved down a slope and settled at its base, as a result of gravitational action.
- Degradation** - (i) The decline in a soil's fertility status as a result of loss of organic matter, erosion by wind or water, compaction, salinization, or acidification. (ii) 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 (leached), light-colored Ae horizon.
- Dissected** - Where the original surface has been cut by running water, leaving a network of channels, shallow gullies, or valleys.
- Dunes** - Wind-built ridges and hills of sand formed in the same manner as snowdrifts. They are started where some obstruction, such as a bush, boulder, or fence, causes an eddy or otherwise thwarts the sand-laden wind. Once begun, the dunes themselves offer resistance and they grow to form various shapes.
- Eluviation** - The transportation of soil material in suspension or solution within the soil by the downward or lateral movement of water.
- Eolian deposit** - Refer to section "2.3 Surface Deposits" on page 2-1 of this report.
- Erosion** - The wearing away of the land surface by running water, wind, ice or gravity.
- Erosivity** - The tendency for a soil to erode or permit erosion.
- Esker** - A winding ridge of irregularly stratified sand, gravel, and cobbles deposited under the ice by a rapidly flowing glacial stream.
- Fan** - Refer to section "2.4 Surface Forms" on page 2-2 of this report.
- Fibric layer** - A layer of organic material containing large amounts of weakly decomposed fiber whose botanical origin is readily identifiable.
- Field capacity** - The percentage of water remaining in the soil two or three days after the soil has been saturated and free drainage has practically ceased.
- Fluvial deposit** - Refer to section "2.3 Surface Deposits" on page 2-1 of this report.
- Genesis** - The mode of origin of the soil, especially the processes or soil-forming factors responsible for the development of the solum, the true soil, from unconsolidated parent material.
- Glacial till** - See "till".
- Glaciofluvial** - Refer to section "2.3 Surface Deposits" on page 2-1 of this report.
- Glaciolacustrine** - Refer to section "2.3 Surface Deposits" on page 2-1 of this report.
- Gleyed soil** - Soil affected by gleysation.
- Gleysation** - A soil forming process, operating under poor drainage conditions, which results in the reduction of iron and other elements, and in gray colors and mottles.
- Gravel** - Rock fragments between 2 mm and 7.5 cm in diameter.
- Grumic** - A fine-textured (clay or heavy clay) soil which cracks extensively when dry and forms angular blocky structures with grooved surfaces in subsoils due to the effect of swelling and shrinking during periods of wetting and drying. Surface horizons are massive, often with granular secondary structure under cultivation.
- Gully** - A channel caused by erosion from concentrated but intermittent flow of water during and immediately after heavy rains or snowmelt. It is deep enough to interfere with and not be removed by tillage operations.

- Heavy soil** - A soil having a high content of fine particles, particularly clay, or a soil having a high drawbar pull and therefore requiring more power to cultivate.
- Horizon** - Refer to section "2.1 The Soil Profile" on page 2-1 of this report.
- Humic layer** - A layer of organic material containing large amounts of highly decomposed organic material; only small amounts of fiber are present that can be identified as to their botanical origin. Fibers can be easily destroyed by rubbing.
- Hummocky** - Refer to section "2.4 Surface Forms" on page 2-2 of this report.
- Humus** - (i) The fraction of the soil organic matter that remains after most of the added plant and animal residues have decomposed. It is usually dark-colored. (ii) Humus is also used in a broader sense to designate the humus forms referred to as forest humus. (iii) All the dead organic material on and in the soil that undergoes continuous breakdown, change, and synthesis.
- Hydraulic conductivity** - The rate at which saturated soils transmit water.
- Inclined** - Refer to section "2.4 Surface Forms" on page 2-2 of this report.
- Infiltration** - The downward movement of water into the soil.
- Kettle** - Depression left after the melting of a detached mass of glacial ice that was buried in glacial debris.
- Knob** - A pronounced, rounded hill commonly found in knob and kettle topography in morainic areas.
- Knoll** - A small, subdued, rounded hill commonly found in knoll and depression topography in areas of till plains.
- Lacustrine deposit** - Refer to section "2.3 Surface Deposits" on page 2-1 of this report.
- Landform** - The various shapes of the land surface resulting from a variety of actions such as deposition (eskers, moraines) and erosion (gullies, valleys).
- Leaching** - The downward removal from the soil of materials in solution.
- Level** - Refer to section "2.4 Surface Forms" on page 2-2 of this report.
- Light soil** - A soil having a high content of coarser particles, particularly sand, or a soil having a low drawbar pull and therefore easy to cultivate.
- Loess** - Material transported and deposited by wind and consisting of predominantly silt-sized particles.
- Mesic layer** - A layer of organic material in an intermediate stage of decomposition; intermediate amounts of fiber are present that can be identified as to their botanical origin.
- Microrelief** - Small scale, local differences in topography, including mounds, swales, or pits that are usually < 1 m in diameter and with elevation differences of up to 2 m.
- Mineral soil** - A soil consisting predominantly of mineral matter. It contains less than 17% organic carbon except for an organic surface layer that may be up to 40 cm thick if formed of mixed peat or 60 cm if formed of fibric peat.
- Moraine** - Distinct accumulations of glacial material, mainly till, deposited directly by glaciers.
- Mottles** - Spots or blotches of different color or shades of color interspersed with the dominant color.
- Neutral soil** - A soil having a pH of 7.0.
- Organic matter, soil** - 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.
- Parent material** - The unconsolidated and more or less chemically unweathered mineral or organic matter from which the solum of a soil has developed.
- Pedology** - Those aspects of soil science involving the constitution, distribution, genesis, classification and mapping of soils.
- Permeability, soil** - The ease with which gases and liquids penetrate or pass through a bulk mass of soil or a layer of soil.
- 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 an electrode or indicator at a specified soil-water ratio, and expressed in terms of the pH scale.
- Ridged** - Refer to section "2.4 Surface Forms" on page 2-2 of this report.
- Rolling** - Refer to section "2.4 Surface Forms" on page 2-2 of this report.
- Runoff** - That portion of the total precipitation on an area that flows away through stream channels and that does not enter the soil.
- Runway** - The channel of a stream.
- Saline soil** - A soil that contains enough soluble salts to interfere with the growth of most crops. The amount of salts, as measured by the electrical conductivity of the saturation extract, is greater than 4 mS/cm. Very sensitive crops may be affected at electrical conductivities of 2 mS/cm.
- Sand** - (i) A soil particle between 0.05 and 2.0 mm in diameter. (ii) A soil textural class. See also "texture, soil".
- very coarse sand** - A soil particle between 1.0 and 2.0 mm in diameter.
- coarse sand** - (i) A soil particle between 0.5 and 1.0 mm in diameter. (ii) A soil textural class. See also "texture, soils".
- medium sand** - A soil particle between 0.25 and 0.5 mm in diameter.
- fine sand** - (i) A soil particle between 0.10 and 0.25 mm in diameter. (ii) A soil textural class. See also "texture, soil".
- very fine sand** - A soil particle between 0.05 and 0.10 mm in diameter.
- Silt** - (i) A soil particle between 0.002 and 0.05 mm in diameter. (ii) A soil textural class. See also "texture, soil".
- 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 environ-

mental 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.

Solum - The upper horizons of a soil in which the parent material has been modified and in which most plant roots are contained. It usually consists of the A and B horizons.

Stratification - The arrangement of sediments in layers or strata marked by a change in color, texture, dimension of particles, and composition. Stratification usually means layers of sediments that separate readily along bedding planes because of different sizes and kinds of material or some interruption in deposition that permitted changes to take place before more material was deposited.

Structure, soil - The combination or arrangement of primary soil particles into aggregates of secondary soil particles, which are separated from each other by surfaces of weakness. These secondary particles may be, but usually are not, arranged in the profile in such a manner as to give a distinct characteristic pattern. The secondary particles are characterized and classified on the basis of size, shape, and degree of distinctness. The general shape types are structureless, plate-like, block-like and prism-like. The terms are:

structureless - Having no observable aggregation or no definite orderly arrangement around natural lines of weakness.

single grain - Loose, incoherent mass of individual particles as in sands.

massive - A coherent mass showing no evidence of any distinct arrangement of soil particles.

block-like - Soil particles are arranged around a point and bounded by flat or rounded sides.

blocky (angular blocky) - Having block-like structures with flat, rectangular faces and sharp, angular corners.

subangular blocky - Having block-like structures with rounded or flattened faces and rounded corners.

granular - Having block-like aggregates that appear as spheroids having curved surfaces which have slight or no accommodation to the faces of the surrounding aggregates.

plate-like - Soil particles are arranged around a horizontal plane and generally bounded by relatively flat, horizontal surfaces.

platy - Having thin, plate-like aggregates with faces mostly horizontal.

prism-like - Soil particles are arranged around a vertical axis and bounded by relatively flat, vertical surfaces.

prismatic - Having prism-like structures with vertical faces well-defined, and edges near the top sharp and somewhat angular.

columnar - Having column-like structures with vertical edges near the top of columns not sharp (columns may be flat-topped, round-topped or irregular).

Substrate modifier - A material of different origin that underlies material in which a soil is formed, at a depth of 1 m or less.

Superglacial - A glaciolacustrine or glaciofluvial deposit laid down in small ponds or lakes on the melting ice surface, which subsequently becomes mixed with or underlain by glacial till upon melting. It is not as uniform as typical lacustrine or fluvial deposits.

Terrace - A nearly level, usually narrow, plain bordering a river, lake, or sea. Rivers are sometimes bordered by a number of terraces at different levels.

Texture, soil - The relative proportions of the various soil particles (sand, silt or clay) in a soil as described by the classes of soil texture. Refer to section "2.5 Surface Texture" on page 2-3 of this report. The limits of the various classes and subclasses are:

sand - Soil material that contains 85% or more sand.

coarse sand - Soil material that contains 25% or more very coarse and coarse sand, and less than 50% of any other one grade of sand.

fine sand - Soil material that contains 50% or more fine sand or less than 25% very coarse, coarse, and medium sand and less than 50% very fine sand.

gravelly sand - Soil material which meets the requirements of a sand but also contains 20 to 50% by volume of coarse fragments from 2 mm to 75 mm in diameter.

loamy sand - Soil material that usually contains 70 to 85% sand but may contain as much as 90% sand depending upon the amount of clay present.

gravelly loamy sand - Soil material which meets the requirements of a loamy sand but also contains 20 to 50% by volume of coarse fragments from 2 mm to 75 mm in diameter.

sandy loam - Soil material that usually contains 52 to 70% sand but may contain as much as 85% or as little as 43% sand depending upon the amount of clay present.

fine sandy loam - Soil material that contains 30% or more fine sand and less than 30% very fine sand or between 15 and 30% very coarse, coarse, and medium sand.

gravelly sandy loam - Soil material which meets the requirements of a sandy

loam but also contains 20 to 50% by volume of coarse fragments from 2 mm to 75 mm in diameter.

very fine sandy loam - Soil material that contains 30% or more very fine sand or more than 40% fine and very fine sand, at least half of which is very fine sand, and less than 15% very coarse, coarse, and medium sand.

loam - Soil material that contains 7 to 27% clay, 28 to 50% silt, and less than 52% sand.

gravelly loam - Soil material that meets the requirements of a loam but also contains 20 to 50% by volume of coarse fragments from 2 mm to 75 mm in diameter.

silt loam - Soil material that contains 50% or more silt and 12 to 27% clay, or 50 to 80% silt and less than 12% clay.

silt - Soil material that contains 80% or more silt and less than 12% clay.

sandy clay loam - Soil material that contains 20 to 35% clay, less than 28% silt, and 45% or more sand.

clay loam - Soil material that contains 27 to 40% clay and 20 to 45% sand.

silty clay loam - Soil material that contains 27 to 40% clay and less than 20% sand.

silty clay - Soil material that contains 40% or more silt and more than 40% clay.

clay - Soil material that contains 40% or more clay, less than 45% sand, and less than 40% silt.

heavy clay - Soil material that contains more than 60% clay.

Till - Unstratified glacial drift, deposited directly by the ice, consisting of a mixture of clay, sand, silt, gravel, and boulders.

eroded till - Glacial till that has been subjected to water erosion subsequent to deposition, often leaving a dense stone lag or stony, gravelly lense on the surface.

water-modified till - Glacial till that has had significant amounts of water-sorted materials incorporated, usually during deposition, that results in less stony than normal glacial till with more sandy, silty or clayey textures than unstratified glacial till.

Tilth - The physical condition of soil as related to its ease of tillage, fitness as a seedbed, and impedance to seedling emergence and root penetration.

Topography - The physical features of a district or region, taken collectively; especially, the relief and contours of the land.

Undulating - Refer to section "2.4 Surface Forms" on page 2-2 of this report.

Veneer - Unconsolidated materials too thin to mask the minor irregularities of the underlying unit surface. A veneer will range from 10 cm to 1 m in thickness and will possess no form typical of the material's genesis. An example of this is shallow lacustrine deposits overlying glacial till.

Water, soil - Water occupying the pore spaces in the soil.

Water table - The upper surface of groundwater or that level in the ground where the water is at atmospheric pressure.

Wilting point - The moisture content of a soil at which plants wilt and fail to recover their turgidity when placed in a dark, humid atmosphere.

Zone, soil - An area in which the dominant soils reflect the zonal influence of climate and vegetation, and form a natural land pattern with other soils that exhibit the zonal influence only weakly or not at all. In Saskatchewan soils, there is a gradual increase in the organic matter content of the surface horizons as one moves from the southwest to the northeast, as reflected by their surface color. This forms the basis of soil zonal separations in the province, namely Brown, Dark Brown, Black, Dark Gray, and Gray.

8. FURTHER INFORMATION

For more information about the data contained in this report or for more information about the Saskatchewan Soil Survey, visit our office, located in Room 5C26 of the Agriculture Building, or write or telephone us at:



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KEY MAP

