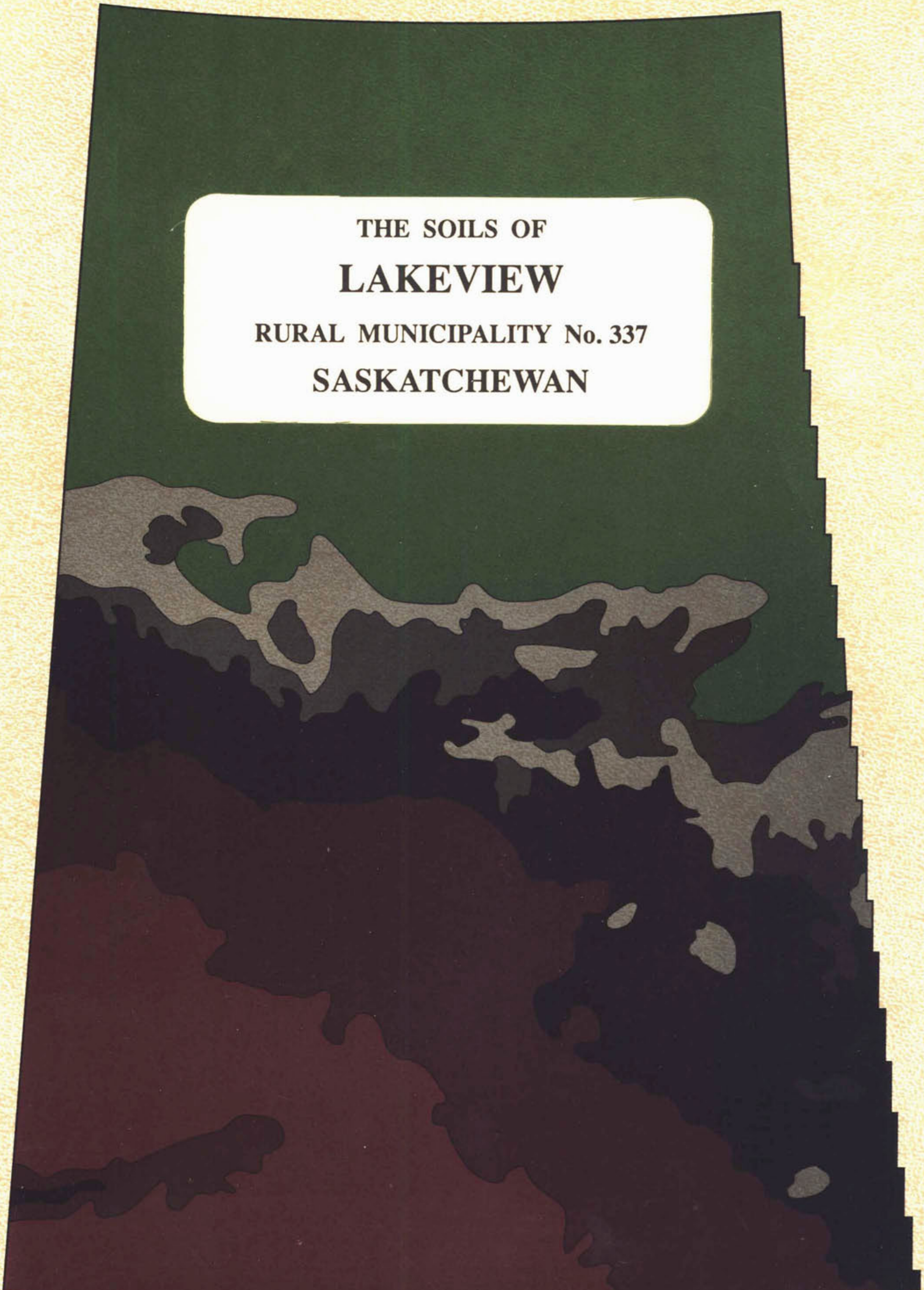
THE SOILS OF

LAKEVIEW

RURAL MUNICIPALITY No. 337

SASKATCHEWAN



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THE SOILS OF LAKEVIEW RURAL MUNICIPALITY No. 337 SASKATCHEWAN

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by

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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.

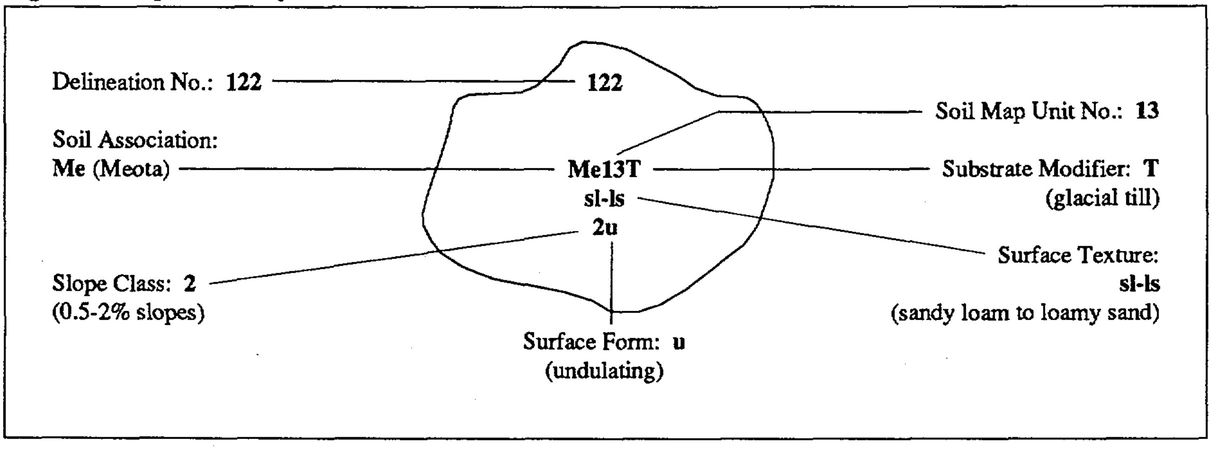
Delineation Number and Soil Interpretations

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 122 (used in the example below), turn to Section 6 and look up the number 122 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 horizons.

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 catergory 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).

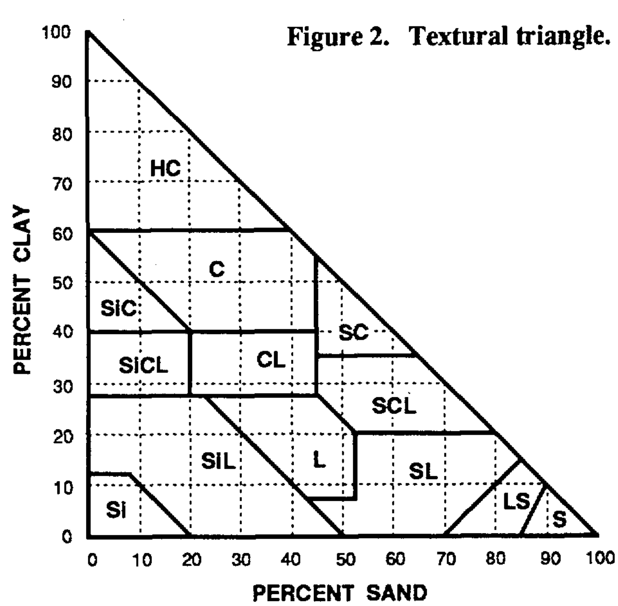


Figure 2. Textural triangle.

3. DESCRIPTION OF SOILS

ALLUVIUM (Av) SOILS

Alluvium soils are a mixture of soils formed in variable-textured alluvial materials, associated with stream flood plains and drainage channels. These soils have formed in materials derived from a variety of sources and thus vary markedly in color, texture, and composition. Surface textures range from sand to clay.

Alluvium soils are usually stone free, but may be underlain by stony deposits. Eroded stream beds within Alluvium areas, for example, may be very stony. Alluvium soils usually occur on level or undulating landscapes with very gentle to gentle slopes.

Alluvium soils occur in complex with soils of other associations and, in most of these complexes, the Alluvium soils occur on the lower slopes in the landscape.

Kinds of Alluvium Soils

Poorly Drained Alluvium - Poorly drained Alluvium soils represent a variety of wet soils. They occur in undrained depressional areas that are subject to flooding and in undrained areas associated with abandoned stream meanders. They often have thick, dark-colored A horizons and drab subsurface colors that are dotted with reddish spots and streaks. They are generally wet for all or a significant portion of the growing season and are often flooded. Most poorly drained Alluvium soils are not cultivated unless drained, although some may become dry enough to cultivate during periods of prolonged drought. In some areas, these soils may be carbonated.

Saline Poorly Drained Alluvium - Saline poorly drained Alluvium soils occur in undrained depressional areas that are subject to flooding, and in undrained areas associated with abandoned segments of river or creek channels. They have thick, dark-colored A horizons and drab subsurface colors that often include reddish spots and streaks. They are wet for all or a significant portion of the growing season and are often flooded. Soluble salts are usually present within 50 cm of the surface. The salts commonly occur as white specks within the soil, although salts may not always be visible.

Agricultural Properties of Alluvium Soils

The agricultural capability of Alluvium soils ranges from class 2, good agricultural soils, to class 7, soils with no capability for arable agriculture or permanent pasture. This wide range in agricultural capability is mainly the result of varying degrees of salinity and excess wetness. Where salinity and wetness are not a problem and where the soil texture provides an adequate water-holding capacity, they are often good agricultural soils. Alluvium soils may be downrated based on other soil and landscape limitations (i.e. stones, topography, flooding, 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.

Alluvium soils generally have a moderate amount of organic matter in the A horizon, resulting in reasonable fertility and good tilth. Because of the association of these soils with lower portions of the landscape and their occurrence in narrow bands in valley bottoms, wind erosion is not usually a serious problem. They are, however, susceptible to water erosion and to flooding because of their association with low landscape positions and drainage channels which receive runoff water in the spring or during periods of intense rainfall. They usually occur on favorable topography but areas are often small and irregular and cut by erosion channels, making cultivation difficult or impractical.

Stones are not generally a problem, however, annual clearing may be required along eroded stream beds. Areas dominated by saline or poorly drained Alluvium soils generally have little potential for crop land and are suitable mainly for forage production or pasture. If drainage can be improved and if salinity and accessibility do not pose serious limitations, some of these areas can be brought into agricultural production.

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 usually occurs on mid- and lower slope positions. 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 light grayish-colored, moderately calcareous 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 and a calcareous B horizon underlain, in turn, by a light 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. Due to their location in the landscape, some of these soils have become saline and/or carbonated.

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.

BREDENBURY (Bu) SOILS

Bredenbury soils are Thick Black soils that have formed in loamy lacustrine materials in moist areas of the Black soil zone, where soils with thicker-than-normal surface horizons have formed. These soils are distinguished from Hamlin soils (thin Black soils formed in loamy lacustrine materials) by having a surface horizon that is greater than 20 cm thick. Surface textures range from sandy loam to loam.

Bredenbury soils are usually stone free. However, some stones may occur where the lacustrine materials are shallow (less than 1 m thick) and underlain by glacial till or gravel, or where the lacustrine materials occur in complex with glacial till or gravel. Bredenbury soils usually occur on undulating landscapes with very gentle to gentle slopes, however, they can also occur on hummocky landscapes with gentle to moderate slopes, particularly where they occur in complex with soils formed in glacial till.

The Bredenbury soils frequently occur in complex with soils of other associations. In most of these complexes, the Bredenbury soils occur on the mid- and lower slopes.

Kinds of Bredenbury Soils

Orthic Bredenbury - The orthic Bredenbury soil occurs on mid- and lower slopes, however, it can extend onto upper slopes in some landscapes. It is a well-drained soil characterized by a black A horizon, 21 to 33 cm thick, underlain by a brownish B horizon and a grayish-brown, moderately calcareous C horizon.

Calcareous Bredenbury - The calcareous Bredenbury soil occurs on mid- and upper slopes, however, it can extend onto lower slopes in some landscapes. It is a well-drained soil characterized by a black, often calcareous A horizon, 20 to 34 cm thick, which is usually underlain by a thin, brownish-colored, calcareous B horizon, overlying a grayish-brown, moderately calcareous C horizon.

Carbonated Bredenbury - The carbonated Bredenbury soil usually occurs on lower slopes, however, it can occur on all slope positions in some landscapes, and is affected to varying degrees by imperfect soil drainage. 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. In addition, the subsoil is often affected by salinity to some degree.

Saline Bredenbury - The saline Bredenbury soil occurs on lower slopes, often surrounding sloughs or poorly drained depressional areas, and along drainage channels and gullies, however, it can occur on all slope positions in some landscapes. 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. It frequently occurs intermixed with carbonated Bredenbury 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 Bredenbury Soils

The best Bredenbury soils are those with a loam to very fine sandy loam surface texture. These soils have an agricultural capability rating of class 2 (good); a moderate moisture deficit, imparted by a moderate water-holding capacity and the subhumid regional climate, is their main limitation. Bredenbury soils with sandy loam to fine sandy loam surface textures have been rated as capability class 3 (fair) due primarily to their lower water-holding capacity. Although many of the Bredenbury soils have few agricultural limitations, some have been downrated based on other 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.

Most Bredenbury soils have a moderately high organic matter content in the A horizon, resulting in soils of reasonably good tilth. They are reasonably fertile soils, although additions of phosphorus and nitrogen are usually required to obtain optimum yields. Bredenbury soils have a weak to moderate cloddy structure that breaks to fine granular and single grain, making them moderately susceptible to wind erosion. Relatively high infiltration rates, coupled with very gentle to moderate slopes, result in a relatively low susceptibility to water erosion. 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. Stones are not generally a problem, however, periodic clearing may be required where the lacustrine materials are shallow (less than 1 m thick) and underlain by glacial till or gravel.

CANORA (Ca) SOILS

Canora soils are Thick Black soils that have formed in highly calcareous, silty lacustrine materials. They have surface horizons that are greater than 20 cm thick. Surface textures are predominantly loam and silt loam, but can range to silty clay loam and clay loam.

Canora 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. Canora soils usually occur on undulating landscapes with very gentle to gentle slopes and, less frequently, on hummocky landscapes with gentle to moderate slopes.

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

Kinds of Canora Soils

Calcareous Canora - The calcareous Canora soil is a well-drained soil that occurs mainly on mid- and lower slopes and, occasionally, on upper slopes and knolls. It is characterized by a black, often calcareous A horizon, 23 to 29 cm thick, which may be underlain by a brownish to grayish-brown, calcareous B horizon, overlying a grayish-colored, strongly calcareous C horizon.

Carbonated Canora - The carbonated Canora soil occurs on lower slopes. It has a highly calcareous A horizon, 20 to 40 cm thick, 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.

Saline Canora - The saline Canora 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. It frequently occurs intermixed with the carbonated Canora 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 Canora Soils

Canora soils are very good agricultural soils of capability class 1. 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, 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.

The thick surface horizons, coupled with high organic matter contents, give rise to soils that are reasonably easy to keep in good tilth. They are highly fertile soils, although they will respond to additions of fertilizer, particularly phosphate, in most years. Stones are generally not a problem. Wind erosion can be a serious problem unless cultural practices that maintain a trash cover are utilized to minimize the risk during summerfallow periods. Similarly, water erosion can be a problem, especially on long slopes, during periods of high runoff. Tillage practices that maximize infiltration rates and impede runoff should be utilized to keep erosion to a minimum.

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, however, when in complex with some soils, most notably Canora, they occur on the upper slope position.

Kinds of Cudworth Soils

Orthic Cudworth - The orthic Cudworth soil usually occupies mid- and lower slopes, however, it can extend onto upper slopes in some 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 grayish-colored, strongly calcareous C horizon.

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.

Carbonated Cudworth - The carbonated Cudworth soil occurs on lower slopes, frequently surrounding sloughs or poorly drained depressions. It has a highly calcareous A horizon, 10 to 20 cm thick, 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.

Saline Cudworth - The saline Cudworth 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. It frequently occurs intermixed with the carbonated Cudworth soils on lower slopes surrounding sloughs.

Agricultural Properties of Cudworth Soils

Cudworth soils with a clay loam or silty clay loam surface texture are very good agricultural soils of capability class 1, however, the majority of Cudworth soils have a loam to silt loam surface texture and are considered 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.

HAMLIN (Hm) SOILS

Hamlin soils are Black soils that have formed in loamy lacustrine materials. Surface textures range from sandy loam to loam.

Hamlin soils are usually stone free, however, stones may occur where the lacustrine materials are shallow (less than 1 m thick) and underlain by glacial till or gravel, or where the lacustrine materials occur in complex with glacial till or gravel. Hamlin soils usually occur on undulating landscapes with very gentle to gentle slopes, however, they can occur on hummocky landscapes with moderate to strong slopes, particularly where they occur in complex with soils formed in glacial till.

Hamlin soils commonly occur in complex with soils of other associations. In most of these complexes, the Hamlin soils occur on mid- and upper slopes, however, they will occur on lower slopes in complex with soils formed in glacial till or sandy fluvial materials.

Kinds of Hamlin Soils

Orthic Hamlin - The orthic Hamlin soil occurs on mid- and lower slopes, however, it can extend onto upper slopes in landscapes where slopes are gentle. It is a well-drained soil characterized by a black A horizon, 12 to 18 cm thick, underlain by a brownish B horizon and grayish-brown, moderately calcareous C horizon.

Calcareous Hamlin - The calcareous Hamlin soil usually 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 Hamlin soils on lower slopes. It is a well-drained soil characterized by a black, usually calcareous A horizon, underlain by a thin, brownish-colored, calcareous B horizon and grayish-brown, moderately calcareous C horizon.

Agricultural Properties of Hamlin Soils

The best Hamlin soils are those with a loam or very fine sandy loam surface texture. These are good agricultural soils of capability class 2; a moderate moisture deficit, imparted by the subhumid regional climate and a moderate water-holding capacity, is their main limitation. Hamlin soils with fine sandy loam to sandy loam surface textures are fair agricultural soils of capability class 3 due primarily to their lower water-holding capacity. Although many of the Hamlin soils have few agricultural limitations, some have been downrated based on other 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.

Most Hamlin soils have a moderate amount of organic matter in the A horizon, resulting in soils of reasonably good tilth. They are low in available phosphorus and high in available potassium. Hamlin soils have a weak to moderate cloddy surface that breaks to fine granular and single grain, making them moderately susceptible to wind erosion. Relatively high infiltration rates, coupled with very gentle to gentle slopes, often result in a low susceptibility to water erosion. Hamlin soils occurring on landscapes with moderate to strong slopes, however, are more susceptible to water erosion. The eroded Hamlin soils on knolls are locally dry because of the rapid runoff associated with these slopes. They have low nutrient reserves and are susceptible to wind and water erosion. It is recommended that soil conservation practices, such as maintenance of crop residues through reduced tillage or leaving stubble standing, strip cropping, 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, however, periodic clearing may be required where the lacustrine materials are shallow (less than 1 m thick) and underlain by glacial till or gravel.

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 lower slope positions, however, it can extend onto upper slopes in some 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, which is usually underlain by a thin, brownish, calcareous B horizon, overlying a light-brown, weakly calcareous C 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.

Carbonated Meota - The carbonated Meota soil occurs on lower slopes, often surrounding sloughs. It is a moderately well- to imperfectly drained soil with a black, usually calcareous A horizon 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.

Saline Meota - The saline Meota soil occurs on lower slopes surrounding sloughs or poorly drained depressional areas, where the upward movement of subsurface water leads to the deposition 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.

This soil frequently occurs intermixed with carbonated Meota 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 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.

MARSH (Mh) SOILS

Marsh soils are Poorly Drained soils that have formed in variable-textured alluvial sediments and are typically associated with low-lying depressional basins and the margins of shallow lakes. In many cases, these soils have formed in material derived from a variety of sources, thus, they can vary markedly in color, texture and composition. These soils are frequently carbonated to the surface and are often saline. Surface textures are primarily silty clay loam but may be more variable along the edges of some lakes, ranging from sandy loam to clay loam.

Marsh soils are usually stone free, however, some stones may occur in areas associated with the edges of shallow lakes. Marsh soils seldom form complexes with soils of other associations. The notable exception is Sedge Peat. In these areas, the Marsh soils occur on upper slope positions where the thickness of the peat is less than 40 cm.

Kinds of Marsh Soils

Poorly Drained Marsh - Poorly drained Marsh soils occur along the margins of shallow lakes and in large depressional areas or drained lake bottoms. Unless artificially drained, these soils are frequently wet for all or a significant portion of the growing season and are often flooded. The majority of these soils have thick, dark-colored A horizons, 10 to 25 cm thick, and drab subsurface colors that often include reddish spots and streaks. These soils are frequently carbonated to the surface (carbonated poorly drained) and, in most cases, are also saline (saline poorly drained), with soluble salts generally present within 50 cm of the surface.

Agricultural Properties of Marsh Soils

Marsh soils are usually wet for all or a significant portion of the growing season, limiting their use for arable agriculture. Improved drainage, however, has permitted cultivation in several areas. These areas are, at best, fair to poor agricultural soils having an agricultural capability rating of class 3 or 4. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

Excess wetness and salinity are the main factors affecting the agricultural productivity of Marsh soils. Without improved drainage, Marsh soils are usually only suitable for improved pasture (class 5) or native grazing (class 6). The organic matter content of the surface horizon is usually high, resulting in reasonable fertility and good tilth. Stones are rarely a problem, except in areas where glacial till occurs at or near the surface. Due to their association with lower landscape positions, which receive runoff water in the spring or during periods of intense rainfall, they are susceptible to water erosion and to flooding, often making cultivation difficult. Wind erosion and topography seldom pose serious problems. Areas dominated by very poorly drained soils, especially those with peaty surfaces, or saline poorly drained soils have limited potential for arable agriculture and are best suited for forage production or pasture.

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. The weakly developed poorly drained soil has a thinner A horizon directly overlying the C horizon. In some areas, the poorly drained soils are almost entirely carbonated. In these areas, they have a highly calcareous A horizon underlain by a highly calcareous B or C horizon. In some cases, the poorly drained soils are also saline. In these areas, soluble salts are usually present within 50 cm of the surface. Saline poorly drained soils often occur intermixed with carbonated poorly drained soils.

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. Areas with peaty surfaces and saline poorly drained soils have little potential for arable agriculture and are best suited for forage production or pasture. 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), 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, highly calcareous C horizon.

Calcareous Naicam - The calcareous Naicam soil occupies mid-to lower slopes in most Naicam landscapes. It is a well-drained soil characterized by a black, often calcareous A horizon, 22 to 34 cm thick, which is usually underlain by a calcareous B horizon, overlying a grayish-colored, highly 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.

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.

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.

PERLEY (Pe) SOILS

Perley soils are Thick Black soils that have formed in sandy fluvial materials. They are distinguished from Meota soils by having a surface horizon that is greater than 20 cm thick. Surface textures range from very fine sandy loam to loamy sand.

Perley 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. Perley soils frequently occur on very gently to gently undulating landscapes, but in some areas, these soils commonly occur on hummocky landscapes with gentle to moderate slopes.

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

Kinds of Perley Soils

Orthic Perley - The orthic Perley soil usually occupies mid-and lower slope positions in most Perley landscapes. It is a well- to rapidly drained soil with a black A horizon, 20 to 36 cm thick, underlain by a brownish B horizon and a light-brown, weakly to moderately calcareous C horizon.

Calcareous Perley - The calcareous Perley soil occurs on mid- and upper slopes and knolls in most Perley landscapes, however, it can extend onto lower slopes in some landscapes. It is a well- to moderately well-drained soil with a black, usually calcareous A horizon, 20 to 37 cm thick, underlain by a brownish-colored, calcareous B horizon and a light-brown, weakly to moderately calcareous C horizon.

Agricultural Properties of Perley Soils

The best Perley soils, particularly the typical or orthic Perley soils with a very fine sandy loam surface texture, are rated as capability class 2; a moderate moisture deficit, imparted by the subhumid regional climate and a moderate water-holding capacity, is their main limitation. Most Perley soils, however, have fine sandy loam to sandy loam surface textures, and are, at best, only fair agricultural soils of capability class 3. Their low water-holding capacity is their main limitation. Perley soils with coarser textures (loamy sands) are even more droughty and are considered to be poor agricultural soils of capability class 4. Perley 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. For example, Perley soils are downrated to class 4 or 5 if the potential for crop production is severely affected by salinity. Ratings for each delineation are listed under the heading "Agricultural Capability" in the Interpretive Data Tables section of this report.

A moderate to high organic matter content makes most Perley soils reasonably fertile, although additions of phosphorus and nitrogen are usually required to obtain optimum yields. Due to their sandy nature and weak structure, these soils are often subject to wind erosion, particularly when the surface is not protected by a trash cover. Tillage practices that maintain a trash cover and management practices that maintain or increase the organic matter content will help reduce this hazard. Water erosion is generally not a problem because of high infiltration rates. Likewise, stones are seldom a problem on these soils.

QUILL LAKE (Qu) SOILS

Quill Lake soils are a mixture of Black, Weakly Developed, Poorly Drained and occasionally Black Solonetzic soils that have formed in a mixture of saline, moderately to strongly calcareous, moderately coarse-textured fluvial to moderately fine-textured lacustrine and glacial till deposits, some of which are water modified or eroded, and are confined to areas within the Quill Lake Basin. The variable nature of these materials reflects the past influence of higher lake levels. Surface textures range from loam to silty clay loam and occasionally sandy loam and loamy sand.

Surface stones range from none to very few on lacustrine materials to moderate on glacial till. Quill Lake soils are usually associated with level landscapes or undulating and hummocky landscapes with very gentle to gentle slopes. Although most of these soils contain a high content of soluble salts, salinity is quite variable. The upper horizons may be salt free in some areas, while others have a pronounced salt crust on the surface.

Kinds of Quill Lake Soils

Orthic Quill Lake - The orthic Quill Lake soil occurs on mid- to upper slope positions in the landscape. It is a well-drained soil characterized by a black A horizon, 10 to 30 cm thick, underlain by a brownish B horizon and a light brownish-gray, moderately to strongly calcareous C horizon.

Calcareous Quill Lake - The calcareous Quill Lake soil occurs on mid- to upper slope positions in the landscape. It is a well-drained soil characterized by a black, often calcareous A horizon, 10 to 30 cm thick, which is usually underlain by a thin, brownish-colored, calcareous B horizon, overlying a light brownish-gray, moderately to strongly calcareous C horizon.

Solonetzic Quill Lake - The solonetzic Quill Lake soil occurs most often on mid- to lower slope positions in the better drained portions of the landscape. It is a moderately well-drained soil characterized by a thin, black A horizon, underlain by a dense, brownish B horizon with weak to strong columnar structure that is very hard when dry, and a light brownish-gray C horizon that is moderately to strongly saline. There may be a thin, grayish-colored, leached layer between the A and B horizons. Where these soils occur in lower portions of the landscape, the B and C horizons may have reddish spots and stains, indicative of formation under conditions of imperfect drainage.

Gleyed Quill Lake - The gleyed Quill Lake soil commonly occurs on mid- and lower slope positions, although it may extend into depressions or onto upper slopes in some landscapes. It is a moderately well- to imperfectly drained soil with a black A horizon, 10 to 30 cm thick, underlain by a B or C horizon. The B and C horizons often have dull colors and reddish spots and stains, indicative of formation under conditions of imperfect soil drainage.

Carbonated Quill Lake - The carbonated Quill Lake soil can occur on all slope positions, especially in low-lying landscapes, and is affected to varying degrees by imperfect soil drainage. It is characterized by a highly calcareous A horizon that is usually thicker than the A horizon of the surrounding upland soils, and is underlain by a strongly calcareous B or C horizon. The B and C horizons often have drab colors and reddish spots and stains, indicative of imperfect soil drainage. The subsoil is often affected by salinity to some degree.

Saline Quill Lake - The saline Quill Lake soil occurs on mid- and lower slopes in most landscapes, however, it may extend onto upper slope positions, especially in low-lying landscapes. 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. It frequently occurs intermixed with carbonated Quill Lake 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, 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 Quill Lake Soils

Quill Lake 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. However, most areas of Quill Lake soils have been downrated to class 4 (poor), class 5 (nonarable and suitable only for improved pasture) or class 6 (nonarable and suitable only for native pasture) due to the presence of soluble salts at or near the surface. Quill Lake soils may also be downrated based on other soil and landscape limitations (i.e. stones, excessive 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.

Only the very best of these soils should be cultivated, utilizing such salt-tolerant crops as sweet clover, slender wheat grass, barley, bromegrass, or Russian wild rye. Continuous cropping practices should be used in an attempt to limit the spread of salinity. Since most of these soils occur on landscapes with very gentle to gentle slopes, they have a low susceptibility to wind and water erosion. Stones are not usually a problem, however, periodic clearing may be required in some fields.

In most areas, excess salts at or near the soil surface present the greatest hindrance to continuous cultivation. The most profitable utilization of these soils is probably as native pasture and hay land, or as seeded pasture and hay land using salt-tolerant grasses.

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.

WADENA (Wd) SOILS

Wadena soils are Black soils that have formed in saline, loamy glacial till. Wadena soils differ from Oxbow soils (thin Black soils formed in loamy glacial till) by having significant quantities of soluble salts in the parent material. Surface textures range from clay loam to loam.

Wadena soils are usually slightly to moderately stony, but some areas may be very stony. Wadena soils usually occur on hummocky landscapes with gentle to moderate slopes, however, they can also occur on hummocky landscapes with strong to steep slopes.

Wadena soils frequently occur in complex with soils of other associations. In most of these complexes, the Wadena soils occur on upper slopes and knolls.

Kinds of Wadena Soils

Orthic Wadena - The orthic Wadena soil occurs on mid- and upper slopes in most Wadena landscapes. It is a well-drained soil characterized by a black A horizon, 10 to 20 cm thick, underlain by a grayish-brown B horizon and a light olive-brown, strongly calcareous C horizon.

Calcareous Wadena - The calcareous Wadena 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 Wadena 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, grayish-brown B horizon and a light olive-brown, strongly calcareous C horizon. This soil is often affected by erosion but the extent of erosion is less than on the eroded Wadena soil.

Eroded Wadena - The eroded Wadena soil, as the name implies, is a Wadena 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 on 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 Wadena Soils

The best Wadena 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. However, most Wadena soils have been downrated to class 3 (fair) due to the presence of high concentrations of soluble salts in subsurface horizons. The presence of these salts significantly reduces yields and may limit the choice of crops. Wadena soils may be further downrated based on other soil and landscape limitations (i.e. salinity, stones, topography, 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.

Wadena soils generally have a moderate organic matter content, resulting in reasonably fertile soils of good tilth. Where these soils occur on landscapes with gentle to moderate slopes, they have a low susceptibility to wind and water erosion. However, where they occur on landscapes with stronger slopes, they will have a high to very high susceptibility to water erosion. Where Wadena 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, cultivation across slopes, and establishment of forages, be utilized to control soil erosion. The eroded Wadena soils on steep knolls have low nutrient reserves and are locally dry because of the rapid runoff associated with these slopes. Wadena soils range from slightly to exceedingly stony, hence, the number of annual clearing operations will vary considerably.

WHITESAND (Ws) 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.

Eroded Whitesand - The eroded Whitesand soil occurs on upper slopes and knolls. It is a rapidly drained soil that has had part or almost all of its topsoil removed by erosion. A lower organic matter content and the presence of carbonates in the A horizon often result in these soils having a much lighter surface color in cultivated fields than the surrounding Whitesand soils.

Carbonated Whitesand - The carbonated Whitesand soil occurs on lower slope positions, often surrounding sloughs. It is a moderately well- to imperfectly drained soil with a black, usually calcareous A horizon, 10 to 25 cm thick, underlain by a highly calcareous B or C horizon. The B or C horizons often have reddish spots and stains, indicative of imperfect soil drainage. Due to their location in the landscape, salts are present in some of the carbonated Whitesand soils.

Saline Whitesand - The saline Whitesand soil occurs on lower slopes, often surrounding sloughs, or in poorly drained depressional areas. 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. Saline Whitesand soils often occur intermixed with the carbonated Whitesand 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 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.

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. It is characterized by a black, often calcareous A horizon, 21 to 33 cm thick, which is usually underlain by a brownish to grayish-brown, calcareous B horizon, overlying 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 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 deposition 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 appropriate 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 Field Beans Faba Beans Peas Corn Sunflowers	Canola Mustard Wheat Flax Fall Rye[a] Oats Barley[a] Sugar Beets	Barley may produce some crop but this land best suited to tolerant forages.
	Forage Crops		
Increasing Tolerance ↓	Red Clover Alsike Timothy	Reed Canary Meadow Fescue Intermediate Wheat Crested Wheat Brome Alfalfa Sweetclover[a]	Altai Wild Rye Russian Wild Rye Slender Wheatgrass[a] Tall Wheatgrass[b]

[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

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, t_1). 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 explantation 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**.

SYMBOL SEQUENCE

3(6)M5(4)TE

- Class 3 soil — 3
- 6/10 or 60% of the delineation — (6)
- Limitation due to insufficient moisture-holding capacity (M) — M
- Class 5 soil — 5
- 4/10 or 40% of the delineation — (4)
- Limitation due to adverse topography (T) and erosion damage (E) — TE

3(6)M5(4)TE means that 60% of the area was placed in Class 3 due to a limitation in moisture-holding capacity and 40% of the area was placed in Class 5 because of limitations due to topography and erosion damage.

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

EXAMPLE

Symbol $\longrightarrow$ **B1** = $B^4C^4A^2$

B^4 - 40% of surface area has a pH in the "B" range (6.1 - 6.7)

C^4 - 40% of surface area has a pH in the "C" range (6.8 - 7.5)

A^2 - 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 Type

Extent Class — **4S2-N** — Water Quality

Size Class

For example: an area with the wetland symbol **4S2-N** would be interpreted as follows: 20 to 40% of the area has shallow marshes that are 1 to 5 acres in size, with fresh to moderately saline water. There may be two wetland symbols listed in the Soil Interpretation section. The first symbol refers to the most common wetland type in the polygon, and the second symbol refers to the next most common. Intermediate types of wetlands can also be expected in most areas. Ten types of wetlands are identified. A description of the wetland types and classes follow.

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 µs/cm³.

H - Saline to Highly Saline. Water conductivity is greater than 15,000 µs/cm³. 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 Saskatchewan Research Council based on detailed field investigations by the Saskatchewan Department of Highways and Transportation.

Table 20. Gravel pit characteristics.

Legal Location					Tested Thickness	Texture (%)			
1/4	Sec	Twp	Rg	Mer	(m)	Gravel*	Sand	Fines	Comments
SW	24	36	15	2	2.3	16.3	79.7	3.8	Clean gravelly sand, no material greater than 80 mm, watertable encountered in some testpits, till and silt at bottom of deposit.
SW	28	35	15	2	2.1	6.0	85.0	8.9	Dirty sand, no material greater than 80 mm, watertable encountered in many testpits, and silt, till and clay at bottom of deposit.

* "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]	40	70	90	120	140	170	205	225	255	275
Probability (%)	>95	90	85	75	65	50	35	25	15	10

[a] Precipitation data from Raymore weather station.

Example: If the probability of receiving 170 mm of precipitation were 50%, then at least 170 mm of precipitation could be expected in 5 out of 10 years.

To asses 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 70%.

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

Crop	Moisture requirements (mm) 125	150	175	200	225	250	275	300	325	350	To convert kg/ha to bu/ac multiply by:
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 Lakeview, Number 337

	Hectares	Acres
TOTAL AREA	85616	211556
SOIL CAPABILITY FOR AGRICULTURE		
Class 1	6866	16967
Class 2	29342	72505
Class 3	15097	37304
Class 4	5928	14649
Class 5	10932	27012
Class 6	4652	11495
Class 7	1793	4431
Class O	0	0
IRRIGATION SUITABILITY		
Excellent	0	0
Good	2556	6315
Fair	27345	67570
Poor	44709	110477
SALINITY		
Very Strong	0	0
Strong	8650	21374
Moderate	5330	13171
Weak	9	23
None	71626	176988
SAND AND GRAVEL		
Sandy	129	318
Sandy and Gravelly	1057	2613
Gravelly	589	1455
STONES		
Non- to Slightly Stony	14565	35991
Moderately Stony	59737	147610
Very Stony	0	0
Excessively Stony	0	0

	Hectares	Acres
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)	8172	20194
D (> 7.5)	66130	163406
SURFACE TEXTURE		
Sands	332	820
Sandy Loams	1255	3100
Loams	62068	153371
Clay Loams	10647	26309
Clays	0	0
Organics	0	0
WIND EROSION POTENTIAL		
Very Low	56314	139151
Low	17164	42413
Moderate	230	568
High	285	704
Very High	0	0
Extremely High	0	0
WATER EROSION POTENTIAL		
Very Low	26031	64322
Low	46786	115608
Moderate	1064	2629
High	108	268
Very High	3	8
WETLANDS AND POORLY DRAINED SOILS		
Open water and lakes	11196	27666
Wet, poorly drained soils	15585	38511

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	Acreage (ac)
1	YkNc13	3	h	l-cl	2WP	2Bst2v	S1	2(8)T3(1)T4(1)W	D3	2C2-N	1	2	W1K	SG1	123.9
2	NcYk7	2-3	ud	cl-l	1WP	2Bqt1v	S1	1(9)2(1)M	D3	1C1-N	1	1D	W1G	SG1	389.7
3	Rw	3	ud	l-cl	2MP	4Dct2	S1	3(6)W5(4)W	D3	5S3-N,3C2-N	1	3D	W1G	SG0	40.6
4	NcOx7	3	h	sil-l	1MP	2Bst2v	S2	2(8)TM3(1)T4(1)W	D3	2C2-N	1	2	W1K	SG0	1065.0
5	YkNc13	3-4	h	l-cl	2MPA	3Cst2	S2	2(7)TM3(2)T4(1)W	D3	2C1-N	1	2	W2K	SG0	439.3
6	OxYk6	3-4	h	l	1MP	2Cst2v	S1	2(6)MT3(2)T4(2)W	D3	2C1-N,2S2-N	1	2	W2K	SG0	798.5
7	OxNc10	3	h	l-cl	2MPA	3Bst2v	S1	2(9)MT4(1)W	D3	2C2-N	1	2	W2K	SG0	238.8
8	NcOx7	2-3	u	cl-l	2MP	3Bsvt1	S1	1(7)2(2)M4(1)W	D3	2S2-N	1	1	W1K	SG0	241.1
9	YkOx6	3-4	h	l-sl	3MPA	4Cst2v	S2	2(5)TM3(3)TM4(2)WN	D3	3C1-N,2S2-N	2	2	W2K	SG1	844.3
10	NcOx11	3	u	cl-l	2MP	3Csv	S1	1(5)2(3)T4(2)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	492.9
11	Mw3	2-3	ud	sl-cl	6MA	4Cwi	S1	5(10)WN	D3	6W6-N,3C4-N	2	1D	W3G	SG1	209.0
12	YkOx16	3	h	l-cl	2MP	3Csv	S2	2(6)TM1(2)4(2)W	D3	3C1-N,2S2-N	1	2	W1K	SG0	217.8
13	OxYk11	3-4	h	l-cl	2MPA	3Cst2v	S2	2(4)MT3(4)T4(2)W	D3	3C1-N	1	2	W2K	SG0	874.5
14	Yk6	3-2	h	l	1WP	1Ct2	S2	2(7)T1(2)4(1)W	D3	3C1-N	1	2	W1K	SG0	147.4
15	Yk12	3-2	u	l	1WP	1Cv	S2	2(8)X4(2)W	D3	3C1-N	1	2	W1K	SG0	1041.6
16	Mw3	2-3	ud	l-cl	6MA	4Cwi	S1	5(7)WN6(3)W	D3	6W6-N,4C4-N	1	1D	W4G	SG0	140.4
17	MeWs13	3-4	h	sl-gsl	1MA	2Cmt2	S1	3(5)M4(5)M	D2	N	2	2	W3B	SG4	180.9
18	OxYk4	3-4	h	l	1MPA	2Dsv	S2	2(7)TM3(3)TW	D2	2C1-N	1	2	W2K	SG0	83.6
19	YkNc7	2-3	u	l-sicl	2MA	3Bsvt1	S1	1(6)2(3)X4(1)W	D3	2C1-N	1	1	W1K	SG0	1249.7
20	YkOx10	3	h	l	2MPA	3Bst2v	S1	2(9)TM4(1)W	D3	2C1-N	1	1	W2K	SG0	236.8
21	OxYk11	3-4	h	l	2MPA	3Cst2v	S2	2(6)MT3(2)T4(2)W	D3	3C1-N	1	2	W2K	SG0	79.6
22	YkNc6	3	h	l-sicl	4MPA	4Dsv	S2	2(5)TP3(1)N4(4)WN	D3	3C2-N,2C1-N	1	2	W2K	SG0	2388.0
23	YkNc6	3	h	l-sicl	4MPA	4Dsv	S2	2(5)TP3(1)N4(4)WN	D3	3C2-N,2C1-N	1	2	W2K	SG0	343.6
24	YkNc13	3	h	l-cl	2MPA	3Bst2v	S1	2(9)TM4(1)W	D3	3C1-N	1	2	W2K	SG0	1064.2
25	YkOx8	3-4	hd	l	1MPA	2Cst2v	S1	2(6)MT3(2)T4(2)W	D3	3C1-N	1	2D	W2K	SG0	940.3
26	YkNc6	2-3	u	l-sicl	5MA	4Csv	S1	2(4)X3(4)N5(2)W	D3	3C1-N,2S3-N	1	1	W1K	SG0	1231.3
27	NcOx7	2-3	u	sil-l	2MPA	3Bst1v	S2	1(5)2(5)M	D3	1C1-N	1	1	W1K	SG1	560.1
28	Rw	4-6	hid	l-cl	4MD	4Dct2	S2	5(6)WE6(4)WE	D3	4W5-N,3E5-N	2	5D	W4G	SG0	7.9
29	Rw	3	ud	l-cl	5MA	4Dct2	S2	5(10)W	D3	5S4-N,4W3-N	1	3D	W3G	SG0	61.1
30	NcYk10	2-3	u	l-cl	2MA	3Bsvt1	S1	1(7)2(2)X3(1)W	D3	2C1-N	1	1	W1K	SG1	273.9
31	CaCd9	2-3	ud	sil-sicl	5MA	4Dsv	S0	2(4)X3(3)N4(3)NW	D3	2C2-N	1	1D	W1KG	SG0	1986.3
32	Rw	3-4	hd	l	6MA	4Dct2	S2	5(7)WE4(3)N	D3	6S6-N	1	3D	W4G	SG0	113.6
33	YkNc7	2-3	u	l-cl	2MPA	3Bsvt1	S1	1(5)2(4)X3(1)W	D3	2C1-N	1	1	W1K	SG0	2196.3
34	MeHm10	3-4	h	ls-sl	0	3Cmt2	S1	4(6)M3(4)M	D1	N	3	1	W3B	S3	43.7
35	YkNc13	3	h	l	2MPA	3Bst2v	S1	2(9)TM4(1)W	D3	2C1-N	1	2	W2K	SG0	868.1
36	YkWd3	3	h	l	2SP	3Dsv	S2	2(6)TM3(3)NW5(1)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	5757.4
37	YkWd2	3	u	l	2MP	3Dsv	S2	1(7)3(2)NW5(1)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	533.5
38	YkWd2	3	u	l	2MP	3Dsv	S2	1(7)3(2)NW5(1)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	558.1
39	Mw3	3-2	h	l	3SP	4Cwi	S2	5(6)WN7(4)W	D3	5O6-N,5S3-N	1	2	U	SG0	1208.0
40	YkWd1	3	h	l	2SP	3Bst2	S2	2(8)TM3(2)N	D3	1C2-N	1	2	W1K	SG0	221.5
41	Wz3	1	l	U	2SA	4Cwi	U	7(10)W	U	6O6-N	U	U	U	SG0	125.0
42	Av6	2	u	l-cl	4MPA	4Dwsv	S1	6(10)NW	D3	4S3-N,2O3-N	1	2	U	SG0	369.9
43	YkBa4	3	h	l-cl	1WP	2Cqv	S2	2(9)T4(1)W	D2	2C1-N,1W2-N	1	2	W2K	SG0	315.9
44	Yk4	3	h	l	1MP	2Csv	S2	2(8)T4(1)W5(1)W	D2	3C1-N,1S2-N	1	2	W2K	SG0	1258.8
45	Yk12	3	h	l	1MP	2Csv	S2	2(8)TP4(1)W5(1)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	682.8
46	Wz3	1	l	U	2SA	4Cwi	U	7(7)W6(3)W	U	6O6-N	U	U	U	SG0	53.8
47	YkOx16	3-4	h	l	1MP	2Cst2v	S2	2(6)T3(2)T5(2)W	D3	3C1-N,1S1-N	1	2	W2K	SG0	138.1
48	Wz2	1	l	sl	3MP	4Cwi	S1	5(5)W7(4)W4(1)W	D3	5O6-N,5S4-N	U	U	U	SG0	287.9
49	YkNc11	3-2	u	l	1SP	2Csv	S1	1(5)2(3)X4(2)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	656.4
50	BuYk11	3-2	h	fl-l	1MP	2Cst2v	S1	2(5)T3(3)M5(2)W	D2	3C1-N,1W3-N	2	2	W1K	SG1	368.2
51	YkBa4	3-2	u	l-cl	1MP	2Cqsv	S2	1(6)2(3)X5(1)W	D2	2C1-N,1W2-N	1	2	W1K	SG0	782.3
52	Mw3	2	u	l	3SP	4Cwi	S2	6(5)W5(4)WN7(1)W	D3	5O6-N,5S4-N	1	1	U	SG0	1577.9
53	YkNc11	3-2	u	l	1SP	2Csv	S1	1(5)2(3)X4(2)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	212.1
54	YkWd4	3	h	l	2SP	3Dsv	S2	2(6)TM3(3)NW5(1)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	4601.9
55	YkWs2	3	u	l-gsl	1MP	2Dsv	S2	2(5)X4(4)MW5(1)W	D3	3C1-N,1S2-N	2	2	W1K	G2	1238.0
56	Yk4	3	ud	l	1MP	2Csv	S2	1(5)2(3)P5(2)W	D3	2S2-N,2C1-N	1	2D	W1G	SG0	1013.3
57	Yk4	3	u	l	1MP	2Csv	S2	1(6)2(2)P4(2)W	D3	3C1-N,1S1-N	1	2	W1B	SG0	257.5
58	YkOx2	4-3	h	l	1SP	2Dsv	S2	3(5)TW2(4)MT6(1)W	D3	2O2-N,2C1-N	2	2	W1K	SG0	1811.8
59	Yk4	3	h	l	1MP	2Csv	S2	2(8)T4(1)W5(1)W	D3	3C1-N,1E2-N	1	2	W2K	SG0	13135.4
60	YkWd2	4	h	l	2SP	3Cst2v	S2	3(8)TN4(1)W5(1)W	D3	2S2-N,2C1-N	2	2	W2K	SG0	508.9
61	YkWd2	3-4	h	l	1MP	2Cst2v	S2	2(5)T3(3)T5(2)W	D3	3C1-N,1E2-N	1	2	W2K	SG0	472.9
62	YkOx16	3-4	h	l	1MP	2Cst2v	S2	2(6)T3(2)T5(2)W	D3	3C1-N,1E2-N	1	2	W2K	SG0	80.9
63	Wz3	1	l	U	2SA	4Cwi	U	7(7)W5(3)W	U	6O6-N	U	U	U	SG0	60.9
64	YkMe6	3-4	h	l-sl	3MP	4Cst2v	S2	2(4)T3(4)TN5(2)W	D3	3C1-N,1S2-N	2	2	W2K	S2	72.4
65	YkWd2	4	h	l	1MP	2Cst2v	S2	3(8)T4(1)W5(1)W	D2	3C1-N,1S2-N	1	2	W2K	SG0	146.5

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	YkOx16	3-4	h	l	1MP	2Cst2v	S2	2(6)T3(2)T5(2)W	D3	3C1-N,1E2-N	1	2	W2K	SG0	110.9
67	BuNc6	3-2	u	fl-cl	3MP	4Csv	S1	3(5)MN1(3)5(2)W	D3	3C1-N,1S3-N	2	2	W1K	SG0	179.4
68	Wz2	1	l	l-cl	1MP	4Cwi	S0	5(5)W7(5)W	D3	6O6-N	U	U	U	SG0	476.7
69	Ca2	3-2	u	l-cl	1MP	2Csv	S0	1(8)4(1)W5(1)W	D3	3C1-N,1W2-N	1	2	W0	SG0	5.6
70	Yk4	3-4	h	l	1WP	1Ct2v	S2	2(6)T3(2)T5(2)W	D3	3C1-N,1E2-N	1	2	W2K	SG0	13.3
71	Rw	3	ud	l-cl	2SP	4Dct2	S2	6(6)W5(4)WE	D3	5O6-N,5S4-N	1	3D	U	SG0	12.4
72	BuNc6	3-2	u	fl-cl	3MP	4Csv	S1	3(5)MN1(3)5(2)W	D3	3C1-N,1S3-N	2	2	W1K	SG0	121.1
73	YkWd2	4-3	h	l	2SP	3Cst2v	S2	3(6)TN2(2)TM5(2)W	D3	2S2-N,2C1-N	2	2	W2K	SG0	1879.4
74	Yk12	3	u	l	1SP	2Csv	S2	1(5)2(3)P5(2)W	D3	2S2-N,2C1-N	1	2	W1K	SG0	844.4
75	YkOx16	4-3	h	l	1SP	2Dsv	S2	3(5)TW2(4)MT5(1)W	D3	3C1-N,1S2-N	2	2	W2K	SG0	176.0
76	YkWd2	4-3	h	l	2SP	3Cst2v	S2	3(5)TN2(3)TM5(2)W	D3	2S2-N,2C1-N	2	2	W2K	SG0	3523.1
77	Wz3	1	l	U	2SA	4Cwi	U	7(10)W	U	6O6-N	U	U	U	SG0	54.8
78	YkWd3	3	h	l	2SP	3Dsv	S2	2(6)TM3(3)NW5(1)W	D3	2S2-N,2C1-N	1	2	W1K	SG0	1953.8
79	Mw3	3-2	u	l-cl	4SA	4Cwi	S2	6(5)W5(4)WN4(1)WN	D3	5O6-N,5S4-N	1	2	W1K	SG0	2836.2
80	YkWd3	3	h	l	2SP	3Dsv	S2	2(6)TM3(3)NW5(1)W	D3	2S2-N,2C1-N	1	2	W1K	SG0	350.4
81	Ox8	4	h	l	1MP	2Dsv	S2	3(9)TW5(1)W	D3	3C1-N,1S2-N	2	2	W2K	SG0	129.5
82	Ox8	4	h	l	1MP	2Dsv	S2	3(9)TW5(1)W	D3	3C1-N,1S2-N	2	2	W2K	SG0	53.6
83	YkWd3	3	h	l	2SP	3Dsv	S2	2(6)TM3(3)NW5(1)W	D3	2S2-N,2C1-N	1	2	W1K	SG0	81.0
84	YkWd3	4-3	h	l	2SP	3Cst2v	S2	3(5)TN2(3)TM5(2)W	D3	2E2-N,2C1-N	2	2	W2K	SG0	3814.0
85	YkWd3	3	h	l	2SP	3Dsv	S2	2(6)TM3(3)NW5(1)W	D3	2S2-N,2C1-N	1	2	W1K	SG0	335.6
86	WdYk1	3	h	l	2SP	3Dsv	S2	2(7)MT3(1)W5(2)NW	D3	2E3-N,2C2-N	1	2	W1K	SG0	1347.9
87	Wz2	1	l	U	2SA	4Cwi	U	5(5)W7(5)W	U	5S2-N,5E4-N	U	U	U	SG0	212.2
88	Rw	3-4	ud	l	2SP	4Dct2	S2	5(6)WE3(4)E	D3	4C2-N,1S2-N	1	3D	W3G	SG0	64.4
89	YkWd3	3	h	l	2SP	3Dsv	S2	2(6)TM3(3)NW5(1)W	D3	2S2-N,2C1-N	1	2	W1K	SG0	5376.8
90	Ox2	4-3	h	l	1SP	2Dsv	S2	3(6)TW2(3)M5(1)W	D3	2S2-N,2C1-N	2	2	W2K	SG0	463.2
91	YkWd3	3	h	l	2SP	3Dsv	S2	2(6)TM3(3)NW5(1)W	D3	2S2-N,2C1-N	1	2	W1K	SG0	5328.7
92	Ox8	4-3	h	l	1SP	2Dsv	S2	3(6)TW2(3)M5(1)W	D3	2S2-N,2C1-N	2	3	W2K	SG0	491.6
93	Yk4	3	u	l	2MP	3Csv	S2	1(5)2(3)P5(2)W	D3	3S2-N,2C1-N	1	2	W1K	SG0	4215.6
94	YkWd2	3	h	l	1MP	2Dsv	S2	2(6)TM3(3)NW5(1)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	766.5
95	Yk4	3-2	u	l	1MP	2Csv	S1	1(8)3(1)W5(1)W	D3	3C1-N,1S1-N	1	2	W1K	SG0	589.1
96	YkNc8	3	h	l-cl	1SP	2Csv	S1	2(8)T4(1)W5(1)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	1782.0
97	Mw3	2	u	l	3SP	4Cwi	S2	5(6)WN6(3)W7(1)W	D3	6S3-N,4O5-N	1	1	U	SG0	123.4
98	Mw3	2	u	l	3SP	4Cwi	S2	5(6)WN6(3)W7(1)W	D3	6S3-N,4O5-N	1	1	U	SG0	129.3
99	Me1T	3-2	ud	sl-ls	0	3Bgt1v	S0	3(6)M4(4)M	D1	N	3	2D	W2BG	S4	56.1
100	Rw	3-5	hd	l-sl	2SP	4Dct2	S2	5(8)WE4(2)T	D3	4S2-N,2E3-N	2	4D	U	SG0	268.0
101	Me1T	3-2	ud	sl-ls	0	3Bgt1v	S0	3(6)M4(4)M	D1	N	3	2D	W2BG	S4	64.9
102	BuYk4	2-3	ud	sl-l	1MP	2Bmt1v	S2	2(5)X3(5)M	D2	1S1-N	2	1D	W1BG	SG0	374.0
103	YkWd1	3	u	l	2MP	3Bst1	S1	1(6)2(2)M3(2)N	D3	1S2-N	1	2	W1K	SG0	1627.7
104	BuYk8	2	u	fl-l	2MP	3Csv	S1	2(4)M3(4)MN4(2)W	D3	3C1-N,1S2-N	2	1	W1B	SG0	257.5
105	BuYk8	2	u	fl-l	2MP	3Csv	S1	2(4)M3(4)MN4(2)W	D3	3C1-N,1S2-N	2	1	W1B	SG0	289.6
106	Qu1	2	u	l-cl	5SA	4Dsv	S2	5(4)NW6(2)N3(4)NW	D3	4S3-H,4C2-N	1	1	W1K	SG0	8639.4
107	Qu2	3-2	u	cl-l	5MPA	4Dsv	S2	3(4)N2(2)M5(4)WN	D3	4S2-N,2C2-N	1	2	W1K	SG0	567.4
108	BaYk4	2-3	u	cl-l	2MP	3Csv	S1	1(8)3(1)N4(1)W	D3	1S2-N,1C1-N	1	1	W0	SG0	51.1
109	Qu2	3-2	u	cl-l	5MPA	4Dsv	S2	3(4)N2(2)M5(4)WN	D3	4S2-N,2C2-N	1	2	W1K	SG0	5748.0
110	YkNc7	2-3	u	l-cl	2MP	3Bst1v	S1	1(7)2(3)X	D3	1C1-N	1	1	W0	SG0	472.9
111	YkNc7	2-3	u	l-cl	2MP	3Bst1v	S1	1(7)2(3)X	D3	1C1-N	1	1	W0	SG0	808.3
112	Qu2	3-2	u	l-fl	5MPA	4Dsv	S2	3(6)NW2(2)M5(2)NW	D3	2S2-N,2C1-N	2	2	W1K	SG0	1366.0
113	Ca5	2-3	ud	cl-l	1SP	2Bqt1v	S1	1(8)2(2)X	D3	1S2-N	1	1D	W1G	SG0	947.0
114	YkBa2	3-2	u	l-cl	1SP	2Cqsv	S1	1(8)4(1)W5(1)W	D3	3C1-N,1S2-N	1	2	W1K	SG0	623.7
115	YkOx16	2	u	l	2MP	3Csv	S2	2(8)MP3(1)NW5(1)W	D3	3C1-N,1S2-N	1	1	W0	SG0	462.2
116	NcYk7	2-3	u	sicl-l	3MPA	4Csv	S1	1(5)2(3)X4(2)NW	D3	2C1-N	1	1	W1K	SG0	1721.0
117	Yk11	3-2	u	l-fl	2MA	3Bsvt1	S1	2(9)X3(1)W	D3	2C1-N	2	2	W2K	SG0	2132.4
118	OxYk7	3	h	l-cl	2MP	3Bst2v	S1	2(9)MT3(1)W	D3	2C1-N	1	2	W1K	SG0	581.0
119	Qu3	2-3	u	l-cl	6SA	4Dsv	S2	5(5)NW6(3)N4(2)N	D3	4S3-N,2C2-N	1	1	W0	SG0	846.1
120	OxYk9	3-2	u	l-sl	4MPA	4Bst1v	S2	2(5)MP3(5)MN	D3	1C1-N	2	2	W1K	SG1	1918.9
121	OxYk3	2	u	sl-l	0	2Bmv	S1	2(6)M3(4)M	D3	N	2	1	W0	SG1	188.1
122	Me13T	2	u	sl-ls	1WP	3Bgv	S1	3(7)M4(3)M	D1	N	3	1	W2B	S4	150.7
123	OxHm1	2-3	u	l-vl	1WP	1Bvt1	S2	2(10)M	D1	1S1-N	2	1	W1K	SG0	216.4
124	Qu4	2-3	u	l-cl	5MA	4Bst1v	S1	3(5)N2(3)M5(2)N	D3	1C2-N	1	1	W0	SG0	179.7
125	Ws7	3	h	gsl-gls	0	4Bmt2v	S0	4(10)M	D2	N	3	1	W1K	G4	180.3
126	Rw	3-4	hd	cl	3MD	4Dct2	S2	5(4)WE6(2)W4(4)WN	D3	5S2-N	1	3D	W4G	SG0	286.1
127	YkOx3	3-2	u	l-sl	2MPA	3Dsv	S2	2(6)X3(4)MW	D3	2C1-N	2	2	W1K	SG1	4356.4
128	YkNc10	2-3	u	l-sil	1MPA	2Bst1v	S2	1(6)2(4)X	D3	1C1-N	1	1	W1K	SG0	2436.2
129	NcOx7	2-3	u	sil-l	2MPA	3Bst1v	S2	1(5)2(5)M	D3	1C1-N	1	1	W1K	SG1	11.4
130	BuPe7	2	u	l-sl	1MPA	2Bsv	S0	2(5)M3(5)M	D3	1C1-N	2	2	W2B	S2	33.8
131	BuNc3	2	u	fl-l	3MPA	4Bsv	S1	2(8)M3(1)N4(1)W	D3	3C3-N	2	1	W0	SG0	21.3
132	MeWs13	3	h	ls-gls	2MPA	3Bmst2	S1	4(10)M	D3	1C1-N	3	2	W3B	SG4	12.4
133	Wz3	1	l	U	1WP	4Cwi	U	7(10)W	U	6P6-N	U	U	U	SG0	69.4
134	BuNc3	2-3	u	fl-l	3MPA	4Bst1	S1	2(9)M3(1)N	D3	1C1-N	2	1	W1K	SG0	102.5
135	Cd14	2	u	cl	2MPA	3Bsv	S0	2(9)X4(1)W	D3	2C3-N	1	2	W0	SG0	86.1

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	Qu4	3	h	l	5MPA	4Dsv	S2	3(4)N2(3)M5(3)NW	D3	2C1-N	1	2	W1K	SG0	1085.4
137	Qu5	2	ud	sil-cl	5SA	4Dsv	S2	4(5)NW3(2)N6(3)N	D3	2C3-N	1	2D	W2G	SG0	210.1
138	Qu3	2-3	u	cl	6SA	4Dsv	S2	5(5)NW6(3)N4(2)N	D3	3C3-N,2S1-N	1	1	W0	SG1	2197.1
139	Me1	2-3	u	ls	0	3Bmt1	S0	4(10)M	D1	N	3	1	W3B	S4	59.9
140	Ox19	3	u	sl	1MP	2Bmst1	S1	3(10)M	D3	N	2	2	W2K	SG1	68.7
141	Cd18	2	u	cl-sicl	4MA	4As	S0	2(8)X4(2)N	D3	N	1	1	W0	SG0	255.7
142	Qu5	2	u	cl-sicl	6SA	4Bs	S1	4(5)N3(2)N6(3)N	D3	1C1-N	1	1	W0	SG0	137.2
143	Mh1	1-2	u	s-cl	6SA	4Dwmv	S2	6(10)NW	D3	6W6-H,4E6-H	4	1	U	SG1	703.8
144	Clair Lake									6L6-N					317.4
145	Qu3	2-3	u	cl	6SA	4Dsv	S2	5(5)NW6(3)N4(2)N	D3	3C3-N,2S1-N	1	1	W0	SG1	2039.9
146	Qu5	2	u	cl-sicl	6SA	4Bs	S1	4(5)N3(2)N6(3)N	D3	1C1-N	1	1	W0	SG0	1825.1
147	Qu4	2-3	u	l-sl	5MPA	4Dsv	S1	3(5)NW2(3)M4(2)N	D3	2C2-N	2	1	W1K	SG0	2413.7
148	Wz3	1	l	U	1WA	4Cwi	U	7(10)W	U	6E6-N	U	U	U	SG0	80.9
149	Rw	3	ud	cl-l	6SA	4Dct2	S2	5(8)NW6(2)N	D3	4S2-N	1	3D	U	SG0	210.1
150	Qu3	2-3	u	cl	6SA	4Dsv	S2	5(6)NW6(4)N	D3	4W3-N,3S1-H	1	1	U	SG0	1140.2
151	Little Quill Lake									6L6-H					26365.9
152	Mh1	1-2	u	scl-cl	6SA	4Dwsv	S2	7(6)W6(4)WN	D3	6E6-H	1	1	U	SG0	399.7
153	BaYk4	2-3	u	cl-l	2MP	3Csv	S1	1(8)3(1)N4(1)W	D3	1S2-N,1C1-N	1	1	W0	SG0	1166.1
154	Rw	3-4	hd	l-cl	6SA	4Dct2	S2	5(8)NW6(2)N	D3	4S2-N	1	3D	U	SG0	508.3
155	BaYk4	2-3	u	cl-l	2MP	3Csv	S1	1(8)3(1)N4(1)W	D3	1S2-N,1C1-N	1	1	W0	SG0	172.1
156	Qu4	2-3	ud	cl-l	5MPA	4Dsv	S2	3(5)NW2(2)M4(3)N	D3	1S2-N,1C2-N	1	1D	W1G	SG0	1259.3
157	Rw	3-4	ud	cl-l	5SA	4Dct2	S2	5(9)NW6(1)N	D3	4S2-H	1	3D	U	SG0	83.3
158	Mh1	1-2	u	scl-cl	6SA	4Dwsv	S2	7(6)W6(4)WN	D3	5A6-H,5E6-H	1	1	U	SG0	4250.6
159	Qu4	2	u	l-sl	5MPA	4Dsv	S2	4(6)NW3(3)M6(1)N	D3	1S2-N,1C2-N	2	1	W1K	SG0	32.6
160	Qu4	2	u	l-sl	5MPA	4Dsv	S2	4(6)NW3(3)M6(1)N	D3	1S2-N,1C2-N	2	1	W1K	SG0	26.8
161	Qu3	1-2	u	l-sicl	6SA	4Dsv	S2	5(6)NW6(3)NW4(1)N	D3	3E6-H,3S3-H	1	1	W0	SG0	3831.7
162	Qu7	2	ud	l-sl	4MPA	4Dsv	S2	3(4)NM2(3)M4(3)WN	D3	3C2-N,1S2-N	2	1D	W1G	SG1	6579.6
163	Qu4	2-3	ud	cl-l	5MPA	4Dsv	S2	3(5)NW2(2)M4(3)N	D3	1S2-N,1C2-N	1	1D	W1G	SG0	642.4
164	Yk6	2	u	l	2SP	3As	S1	1(6)2(4)X	D3	1C2-N	1	1	W1K	SG1	1309.1
165	OxYk12	2	u	l	3MPA	4Dsv	S2	2(7)MP5(3)WN	D3	2O5-N,2S2-N	1	1	W1K	SG1	558.2
166	YkWd1	2-3	u	l-cl	2SP	3Bsvt1	S2	1(7)3(2)N5(1)W	D3	1S2-N,1C1-N	1	1	W1K	SG0	896.4
167	Wadena														511.2
168	OxWs4	3-2	u	l-sl	1SP	2Dsv	S2	2(5)M3(3)M4(2)M	D2	1S2-N	2	2	W1K	G2	726.5
169	Qu7	3	u	l-sl	4MPA	4Dsv	S2	3(4)NM2(3)M4(3)WN	D3	3C2-N,1S2-N	2	2	W1K	SG1	1198.8
170	Qu4	3-2	u	l-sl	5MA	4Bst1v	S2	4(5)N3(3)MN5(2)N	D3	1C1-N	2	2	W1K	SG0	33.5
171	OxWs4	2	u	l-sl	2MP	3Dsv	S2	2(6)M3(2)M4(2)M	D2	1S2-N	2	1	W1B	G2	2811.8
172	OxWs4	3	ud	l-sl	1MP	2Dsv	S2	2(5)M3(3)M4(2)M	D2	N	2	2D	W1G	G2	287.4
173	Rw	3	ud	l	2SP	4Dct2	S2	5(6)EW6(4)W	D3	4O4-N,3S3-N	1	3D	W3G	G2	177.8
174	Rw	3	ud	l	2SP	4Dct2	S2	5(6)EW6(4)W	D3	4O4-N,3S3-N	1	3D	W3G	SG1	213.4
175	YkWd1	2-3	u	l-cl	2SP	3Bsvt1	S2	1(7)3(2)N5(1)W	D3	1S2-N,1C1-N	1	1	W1K	SG0	176.9
176	OxYk5	3	h	l	2MP	3Csv	S2	2(8)MT4(1)W5(1)W	D3	2C2-N,2S2-N	1	2	W1K	SG0	1089.0
177	Rw	3	ud	l	2MP	4Dct2	S2	5(6)WE6(4)W	D3	4O3-N,4S2-N	1	3D	W3G	SG0	235.1
178	YkWd3	3	h	l	2SP	3Dsv	S2	2(6)TM3(3)NW5(1)W	D3	2S2-N,2C1-N	1	2	W1K	SG0	1024.3
179	OxYk7	4-3	h	l	1MP	2Cst2	S2	3(5)T2(4)MT5(1)W	D3	1S2-N,1C1-N	2	2	W2K	SG0	145.0
180	Rw	3	ud	l	2MP	4Dct2	S2	5(6)WE6(4)W	D3	4O3-N,4S2-N	1	3D	W3G	SG0	131.5
181	OxYk6	3	h	l	2SP	3Csv	S2	2(8)MT5(2)W	D3	3S2-N,2C1-N	1	2	W1K	SG0	2674.3
182	OxYk7	3-4	h	l	1MP	2Cst2	S2	2(6)MT3(3)T5(1)W	D3	1S2-N,1C1-N	1	2	W2K	SG0	111.0
183	OxYk7	3-4	h	l	1MP	2Cst2	S2	2(6)MT3(3)T5(1)W	D3	1S2-N,1C1-N	1	2	W2K	SG0	87.3
184	OxYk4	3	u	l	2MP	3Bsvt1	S2	2(9)M4(1)W	D3	1S2-N,1C1-N	1	2	W1K	SG0	2226.1
185	Wz3	1	l	U	3SA	4Cwi	U	7(10)W	U	6O6-N	U	U	U	SG0	104.2
186	Ox10	2	ud	l-sl	1SP	2Bsv	S2	2(7)M3(3)M	D2	N	2	1D	W1G	SG1	472.2
187	MwOx1	2-1	u	l-sl	5SA	4Cwi	S2	5(6)NW3(2)M4(2)NW	D3	4C3-N,4W3-N	2	1	W1K	SG0	19.6
188	Yk4	3	u	l	2SP	3Csv	S2	1(5)2(3)P4(2)WN	D3	3C1-N,1S2-N	1	2	W0	SG0	554.1

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 a "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 heterogenous 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 - The portion of the total precipitation falling upon an area that flows away through stream channels or over the surface instead of entering 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. As measured by the electrical conductivity of the saturation extract, the amount of salt present is great enough to produce a reading 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 environmental factors of: parent material, climate (including moisture and temperature effects), macro- and microorganisms and topography, all acting over a period of time and producing a product (soil) that differs from the material from which it is derived in many physical, chemical, biological and morphological properties and characteristics.

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 that 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 that 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 that 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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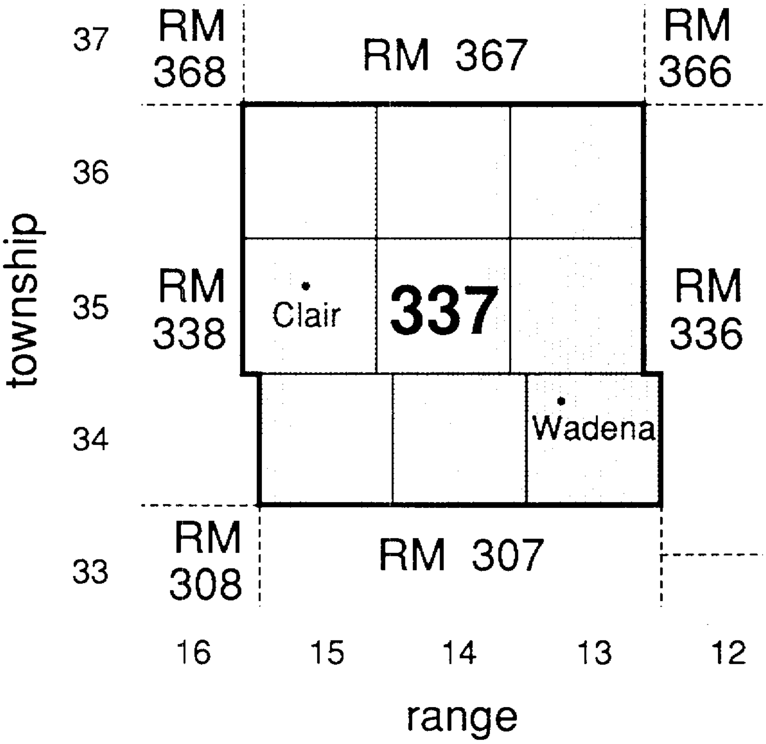
KEY MAP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