



United States
Department of
Agriculture

Natural Resources
Conservation
Service

In cooperation with the
Montana Agricultural
Experiment Station

Soil Survey of Toole County, Montana

Part I



How to Use This Soil Survey

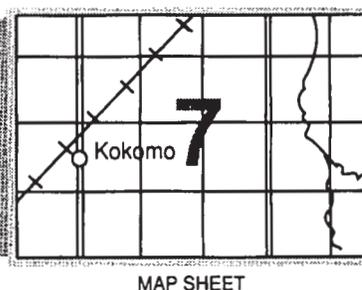
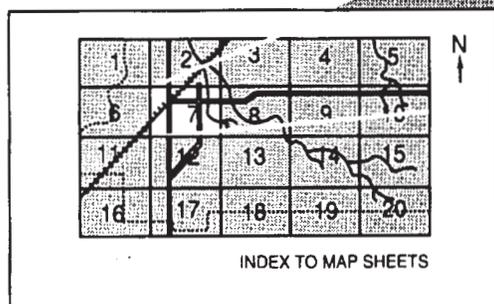
This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the detailed soil map units and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

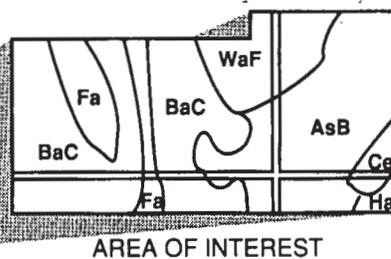
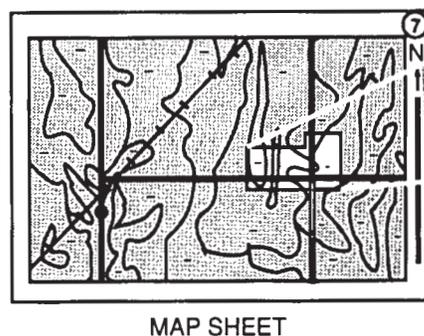
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.



The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

A **State Soil Geographic Data Base (STATSGO)** is available for this survey area. This



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

data base consists of a soils map at a scale of 1:250,000 along with groups of associated soils. It replaces the general soils map published in older surveys. This map and its data base can be useful for planning multi-county areas and map output can be tailored for specific use. For more information about the State Soil Geographic Data Base for this survey area, or for any portion of Montana, contact your local Natural Resources Conservation Service office.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1990. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1990. This survey was made cooperatively by the Natural Resources Conservation Service and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Toole County Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: Typical area of strip cropping on Telstad-Joplin loams, 0 to 4 percent slopes.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is <http://www.nrcs.usda.gov> (click on "Technical Resources").

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Foreword

This soil survey contains information that can be used in land-planning programs in Toole County, Montana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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State Conservationist
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Soil Survey of Toole County, Montana

Fieldwork by Bruce C. Evans, Don J. Feist, Stephen L. Herriman, James M. Hoag, William R. Johnson, Linda J. Richmond, and Richard M. Saunders, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
the Montana Agricultural Experiment Station

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate map, however, soil

scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all

of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Nature of the Survey Area

This section provides general information about the survey area. It describes history, settlement, and farming; markets and transportation; physiography, relief, and drainage; natural resources; geology and geomorphology; and climate.

This soil survey updates the "Soil Survey Reconnaissance of the Northern Plains of Montana," published in 1929. It provides additional information and has larger maps which show the soils in greater detail.

Toole County is in the north-central part of Montana (fig. 1). Total land area is about 1,245,400 acres, but does not include 4,594 acres of denied access in Sweetgrass Hills in the north-central part of the county. It is bounded on the north by the Province of Alberta, Canada; on the west by Glacier County; on

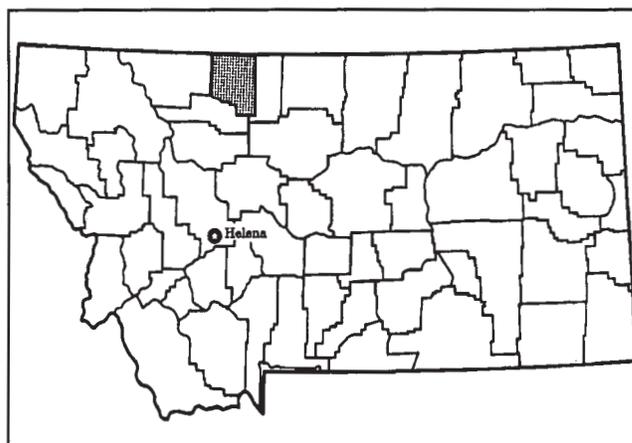


Figure 1. Location of Toole County in Montana.

the south by Pondera County; and on the east by Liberty County.

Descriptions, names, and delineations of soils in the soil survey do not fully agree with those in the adjacent Glacier County Area and Part of Pondera County, Montana survey area. Differences are the result of better knowledge of soils, modifications in series concepts, differences in intensity of mapping, or in the extent of soils within the survey.

History, Settlement, and Farming

Toole County is an area rich in history. Lewis and Clark passed through during their 1804-1805 expedition, when it was Blackfeet Territory. The Maria's River that flows through the southern portion of the county was named by Captain Lewis. The name has since evolved to the Marias River. The river serves as a major watershed for the Lewis and Clark mountain range. The area became a great place for trade with the Indians and with Canada in the years that followed the expedition. One famous route was the 200 mile long "Whoop-Up Trail," which was a freight trail from Fort Benton to Canada. The major stopping point along the trail was Fort Conrad, which is now in southern Toole County.

Shelby, which is now the county seat of Toole County, was founded in 1891. It was first known as "Greasewood Flats," and later as "Shelby Junction." Shelby was formed because of its convenient trading location at the new Great Northern Railroad junction. In 1890 this railroad linked Great Falls to Lethbridge, Canada, and made the prairie accessible to settlers. Toole County was established as in 1914. It was named for the first governor of Montana, Joseph K. Toole. It had previously been a part of Chouteau County, as well as of Teton and Hill Counties.

Toole County is currently among the top seven counties of Montana for the production of spring wheat, Durham wheat, and barley. Before about 1910, there was no farming in the area. It was a vast, unfenced range for sheep and cattle ranchers. During the early 1900's, the town of Shelby enjoyed a thriving sheep-shearing business. Sheep were trailed to Shelby from as far away as the town of Choteau. As many as 300,000 to 400,000 sheep would be shorn in Shelby each spring. This business changed around 1910 to 1915 with the advent of the Homestead Act and the arrival of the first plows. Fences were put up and there was no longer open rangeland. In 1923, the discovery of oil and gas caused a big growth in the county population. In the 1930's, Toole County was one of about three counties in northern Montana to provide approximately 90 percent of the Nation's mustard supply.

Today Toole County is an important agricultural area in the state, producing approximately 4 1/2 million bushels of barley and 5 1/2-million bushels of wheat annually. Most of this is grown through dryland farming. Oats, hay, cattle, sheep, horses, and hogs are also important commodities. Being located along the only interstate highway in Montana that leads into Canada, Toole County still serves as an important trade junction. In addition, the east-west Burlington Northern freight and the Amtrak Hi-lines railroads pass through the county.

Markets and Transportation

The town of Shelby is a major market and retail center for Toole County and the surrounding area. Smaller towns such as Sunburst, Devon, Dunkirk, Galata, Sweetgrass, Kevin, Oilmont, and Ethridge have various services and markets.

Toole County is a major producer of wheat and barley in Montana. Most of the grain produced is transported from the area by truck or rail. Grain terminals are located in Shelby, Devon, Sweetgrass, and in Sunburst. Cattle production is also a major agricultural business in the county, with livestock shipped to feedlots in other areas.

Two major roads crossing the survey area are Interstate 15, which runs north-south; and U.S. Highway 2, which nearly parallels the railroad in an east-west direction. The two roads intersect in Shelby. A 24-hour Port-of-Entry is located on the U.S./Canadian border at Sweetgrass, Montana. Local highways in the area are Highway 215, which runs west of Kevin; Highway 343, which runs east of Oilmont; Highway 417, which runs south of U.S. Highway 2, across the Marias river on the F-bridge,

and joins Highway 366; and Highway 366, which runs across the southeast corner of the county through Ledger. An extensive network of gravel roads provides corridors through the farming and ranching areas of the county.

Bus service runs along Interstate 15. The railway runs east-west and north-south; Amtrak passenger service runs only east-west. A small airport with two asphalt runways is located in Shelby, and a grassed runway is located in Sunburst.

Physiography, Relief, and Drainage

Toole County is in the glaciated part of the Missouri Plateau, which is in the Great Plains Province. The parent materials in this area are the materials weathered from sedimentary and igneous rocks; the loamy and clayey deposits laid down as glacial till and glaciolacustrine deposits; and alluvium along the uplands and valleys. The landscape is mainly nearly level to rolling plains and uplands. The elevation ranges from about 2,900 feet where the Marias River flows in the southeast corner of the survey area to about 6,950 feet in the northern part of the county at West Butte, in the Sweetgrass Hills.

The largest river in the county, Marias River flows from west to east into the Lake Elwell Reservoir. Willow Creek flows from north to southeast, also into Lake Elwell Reservoir.

Natural Resources

Toole County is known for its oil and gas production, but other natural resources in the area include gold, coal, sand, and gravel. In 1922, the first oil well was drilled in the Kevin-Sunburst Field. This discovery uncovered a large amount of oil, which led to extensive exploration and development in the area. During the 1920's, 30's, and 40's, the economy was dominated by the oil industry.

Natural gas was discovered in Sweetgrass Hills area of Toole County in 1915, and later in the Sunburst-Shelby Field. Gas exploration and development was slow because no natural gas market existed. In the late 1920's, a gas pipeline was completed to Great Falls. This provided both the Sweetgrass Hills and the Kevin-Sunburst area the needed natural gas market, and more exploration began.

Oil and gas production increased during the 1960's with new discoveries in the Sweetgrass Hills and more development of the Sunburst-Shelby Field. Gas pipelines began to cross the county, and gas wells were being drilled in areas that would previously not

have been considered commercial. Most of the new gas production was shallow gas, so compressor plants were built to deliver the low pressure natural gas to its destination.

Oil and gas continued to be developed through the 1980's, although drilling took a dramatic downward turn in the mid-1980's when oil prices dropped. Natural gas drilling is the main emphasis in Toole County today because the market for gas has increased.

Mining has played a small role in Toole County's natural resource history. Coal was discovered on West Butte in 1900. It was of limited extent, although small amounts were sold to a local market. Gold was first discovered in 1884 by a Blackfoot Indian at what is now called Gold Butte. A small mining town was founded at the base of Gold Butte for the many people who were trying to find their fortune in gold. Most of the gold came from the Placer deposit, between 1904 and 1945. Although some interest to mine more gold still exists, little development has taken place in recent years.

Small quarries of sand and gravel are scattered throughout the county but no commercial production has been developed.

Geology and Geomorphology

Toole County is characterized by a wide variety of geomorphic features ranging from the steep-sided Sweetgrass Hills to gently rolling glacial topography. The Marias River flows across the southern part of the county and has several tributaries which drain the area. Pleistocene glacial deposits make up the majority of the surface materials with the exception of the Tertiary intrusive rocks of Sweetgrass Hills, and limited outcrops of the Cretaceous-aged sedimentary rocks along the bluffs and stream channels.

The stratigraphic sequence of rocks exposed in Toole County ranges from Mississippian age, 325 million years before present, to Quaternary deposits which are less than 2 million years old. These are described in order from oldest to youngest.

The oldest rocks, the Madison Limestone of Mississippian age, are at a small outcrop on the flanks of West Butte in the northeast corner of the county. This limestone is blue-gray in color, has distinct bedding, and has been metamorphosed locally. Overlying the Madison river is the Jurassic-aged Ellis Formation, which consists of dark-gray limestone, black limy shale, and calcareous sandstone.

The majority of bedrock underlying the glacial deposits in the area are Cretaceous-aged sedimentary deposits. The Cretaceous age was from 65 to 135 millions years before present. These strata are

characterized by alternating sequences of marine and continental material deposited as the vast inland sea that covered the area repeatedly advanced and regressed.

The oldest and most extensive of these deposits within the survey area is the Colorado Group of Lower Cretaceous age. This sedimentary strata, deposited during the last stages of an extensive marine invasion from the southeast, is composed of dark gray to black marine shale interbedded with thin bentonite beds which weather to a bright yellow, and lenses of sandstone and concretionary limestone. Marine invertebrate fossils and sharks teeth are in many of the shale beds. The Colorado Group is more than 1,000 feet thick and is exposed throughout the county in the banks of the Marias River and in most major stream valleys, as well as in the bluffs near the western county line. Typical soils derived from this formation include Neldore and Bascovy.

The remainder of the Upper Cretaceous-aged sediments belong to the Montana Group and are almost exclusively in outcrops along the bluffs in the extreme western and northeastern portions of the survey area. As the sea gradually withdrew, the Telegraph Creek Formation was deposited as continental and brackish-water sediments. The formation, the oldest within the Montana Group, is an interbedded sequence of thinly to coarsely laminated, fine grained, buff-to-gray calcareous sandstone, and gray sandy shale and shale. The Telegraph Creek Formation averages about 150 feet in thickness and is in outcrops in the upper drainages of Willow Creek and its tributaries, and along the base of the western bluffs. Typical soils derived from this formation include Cabbart, Delpoint, and Yamacall.

Following the complete withdrawal of the inland sea, the predominantly continental Eagle Formation was deposited. The formation is separated into the Upper Member and the lower Virgelle Sandstone. The Virgelle Sandstone is a grayish-buff to yellow, massive to crossbedded, friable sandstone deposit. It is an average of 85 feet thick and often forms bold cliffs exhibiting concretions of ferruginous and calcareous sandstone and hematite nodules. Also throughout the Virgelle Sandstone are fragments of petrified wood. This lower member of the Eagle Formation is considered an excellent source of drinking water for much of north-central Montana; however, most of the formation within the county is above the water table. The Upper Member of the Eagle Formation is up to 150 feet thick and is composed of alternating and interfingering beds of shale, carbonaceous shale, mudstone, siltstone, and crossbedded sandstone. This sequence indicates the return of a fluctuating

marginal-marine depositional environment. The majority of this Upper Member consists of buff, gray, and brownish-purple mudstone lenses as thick as 12 feet. Many of the shale beds are carbonaceous and contain fossil plant fragments. Fossilized wood is in the massive sandstone portions of the formation. Rounded ironstone concretions are common in the lower portions of this member. Typical soils derived from this formation include Cabbart, Delpoint, Marmarth, Dast, and Doney.

Overlying the Eagle Formation is the Claggett Shale, indicating the complete advancement of the inland sea once again. The Claggett is chiefly dark gray with iron-stained limestone and sandstone concretions. Numerous bentonite beds up to 3 feet thick occur at the base of the formation. The upper portion of the formation consists of alternating shale and crossbedded platy sandstone lenses. The total thickness of the Claggett is over 400 feet. Typical soils derived from this formation include Neldore, Bascovy, Sagedale, and Wayden.

As the inland sea regressed once more, the continental and brackish water sediments of the Judith River Formation were deposited. The Formation is characterized by alternating sandstone and shale lenses. The sandstone beds are massive, crossbedded, and calcareous; they often form ledges, benches, and cap rocks. The shale lenses are gray to brown and are usually less than 3 feet thick. They occasionally contain fossil plant matter. The maximum thickness of the Judith River formation in this county is thought to be about 600 feet. Typical soils derived from this formation include Cabbart, Delpoint, Yamacall, Doney, and Marmarth.

The Tertiary Period follows the Cretaceous Period, and ranges from 65 to 2 million years before present. In the early portion of this period, the Toole County area became geologically active and was characterized by the uplift of the Sweetgrass Arch, and by the igneous intrusion of the Sweetgrass Hills. This uplift caused the upwarping of the older Cretaceous sediments and the Mississippian-aged limestone, allowing oils and natural gas deposits to migrate up and become trapped in the anticlinal arch. This area is now referred to as the Kevin Dome.

The Sunbust Dome gas and oil fields have been in production since the early 1930's. The majority of the wells are approximately 2,000 feet in depth, and pump oil and gas from the Mississippian-aged Madison Limestone. Shallow wells also produce from the Cretaceous-aged Kootenai Formation and the Jurassic Ellis Formation.

The Sweetgrass Hills consist of three major peaks and several lesser ones. West Butte and Middle (or

Gold) Butte are located in Toole County. These peaks rise conspicuously over 3,000 feet above the plains as intrusive stocks and laccoliths. Like many of the other intrusive mountains in central Montana, the Sweetgrass Hills are composed of pale syenites unusually rich in sodium and potassium. Metamorphism of the preexisting sedimentary bedrock associated with these intrusions produced some minor veins of gold, silver, and lead. These deposits were mined; however, most of the mining operations were small and were played out in a few years. The uplift also brought to the surface the oldest sedimentary rocks exposed in the county: the Ellis and Madison Limestone formations described previously.

Although the Sweetgrass Hills are perhaps the most striking landforms in the county, the majority of the landforms and drainage patterns, and the associated soils development, are the direct result of the continental glaciation during the Pinedale ice age 15,000 years ago. With the exception of the Sweetgrass Hills, the entire county was overridden by thick continental glaciers (Colton, 1961). The bluffs along the western border of the county mark the edge of the most recent glaciers. The large ridges of glacial debris that adjoin the bluffs are the lateral moraines of the Laurentide ice sheet. Lateral moraines were deposited along the flanks of the Sweetgrass Hills as the glacier went around them. Moraines consist of unsorted clay, silt, sand, and cobbles. Much of the remaining glacial material in the county was deposited as gently rolling ground moraine.

Two separate ages of till have been identified in the survey area. The older of the two tills is the Lothair till, which is predominantly northeast of Willow Creek. The till is light tan but weathers to buff, and is unsorted with material ranging from clay-size to boulders as large as 3 feet in diameter. The till averages 50 feet in thickness. In many locations clay- and sand-sized particles predominate, and the till resembles loess. It is usually firm and compact when dry; however, when wet it becomes semiplastic. Typical soils formed from the Lothair till include Williams, Vida, and Zahill.

The younger Pondera till lies stratigraphically over the Lothair till and covers the county west and southwest of Willow Creek. The Pondera till is light brown but weathers to chocolate brown. It contains small amounts of unsorted pebbles and cobbles that lack the manganese staining associated with the pebbles and cobbles of the older Lothair till. The Pondera till is semiplastic below about a foot in depth, and the surface is usually hard and brittle. Knob and kettle topography is more common in the younger till, whereas the older till is more dissected. Typical soils

formed from the Pondera till include Telstad, Joplin, and Hillon.

Streamlined hills called drumlins are located throughout the county in a north- to south-trending direction. These ellipsoidal till deposits can be stratified and are usually in parallel groups. Their orientation is one indication of the direction of the ice movement. Many locations have layers of light-yellow to buff, even-bedded, massive silt deposits. This intra-till silt was deposited in temporary lakes as the ice sheet retreated. Windblown loess was deposited over the till to about 2 feet in thickness; however, most of this was subsequently eroded away and are now alluvial deposits within the stream channels, drainageways, and coulees.

As the ice sheets melted, several forms of glaciofluvial material were deposited and left localized deposits of silt, sand, and gravel. Some eskers and kames are located in the central portion of Toole County. Eskers are sinuous ridges of stratified sand and gravel; they are about a mile long, 30 feet wide, and 10 feet high. Kames are mound-like hills of glacial drift, composed chiefly of stratified sand and gravel. Several groups of morainal ridges occur throughout the county as well. These typically are closely spaced low ridges following the direction of ice and meltwater movement; the morainal ridges (washboard moraines) are usually oriented in groups perpendicular to the retreating glacier.

Most of the current drainages follow the coulees and outwash channels left by the glacial meltwaters. Several coulees do not host streams today. The north-south valley system that extends along the western portion of the county, closely paralleling the interstate freeway, is the largest of these ancient river drainages. It is believed by many scientists that this was the antecedent drainage of the Milk River. Today the lowland area is occupied with shallow lakes, closed depressions, and wetlands. Recent alluvium has been deposited in these broad valleys and some peat and muck deposits are in the wetland areas.

During the past 10,000 years, after the complete melting of the last glacial advance, the majority of landforms within Toole County have been formed by erosion rather than by sedimentation. Stream valleys that mostly occupy the preexisting coulees have cut down through the glacial till and bedrock, creating a dissected landscape. In the southern portion of the county and along the Marias River, the erosion and down-cutting is so extensive that the area is characteristic of badland topography.

In one of the ancient stream channels west of the town of Galata, is a 2½ foot thick bed of ash. Approximately 6,600 years before present Mount

Mazama, a volcanic mountain in southwestern Oregon, erupted and deposited ash across the country. The thickness of the Galata bed suggests that it was deposited in water, probably a very slow moving stream, and has since been partially eroded away. Although this is the only documented location of Mazama ash in the county, it is very likely to have accumulated in other alluvial valleys, and has yet to be identified.

In the Marias River and Willow Creek valleys, recent alluvium forms flood plain deposits of sand and gravel with a 2-foot-thick silt deposit on the surface. Most of the tributary valleys have small flood plains composed of sand and silt. The majority of these deposits are the result of streams eroding and redepositing the glacial sediments.

Climate

Summertime in Toole County is generally pleasant, with cool nights and moderately warm and sunny days with slight to moderate breezes. Most rainfall is in the form of showers or thunderstorms and usually occurs in the late spring or early summer months. Most summers pass with the highest temperatures failing to reach 100 degrees, and an average year will have only 15 days with maximums of 90 degrees or higher. Weather stations at Dunkirk, Goldbutte, Shelby Airport, Sunburst, and Sweetgrass show that freezing temperatures do not occur in July, rarely in June or August, and occur more often in May and September. On rare occasions frost may occur in low lying areas at any time of the year.

Winters are not as cold as usually expected of continental locations at this latitude, largely as a result of the "Chinook" winds for which north-central Montana is noted. While subzero temperatures associated with cold waves are common in the winter, these periods seldom last more than a few days at a time, and are usually terminated by the southwesterly Chinook winds. The name "Chinook" is a loosely defined Indian term meaning "Snow Eater," and is used to describe the effect these warm winds have on the area. Changes in atmospheric pressure along the Rocky Mountain front can create strong winds and sharp temperature rises of 40 degrees or more within a period of less than 24 hours. As a result of these periodic warm winds, the ground is usually bare or nearly bare of snow for most of the winter.

The "Temperature and Precipitation" table gives data on temperature and precipitation for Toole County. The "Freeze Dates in Spring and Fall" table gives probable dates of the first and last freezing periods in the spring and fall. The "Growing Season"

table provides data on the length of the growing season.

Differences in the amount of precipitation are considerable within Toole County. The wettest areas are located in the Sweetgrass Hills. Precipitation generally falls in the form of snow during late fall, winter, and early spring. Rain can occur in any month, but usually falls in the spring and early summer months. Hail is observed occasionally during summer rain squalls and thunderstorms.

Although the average annual precipitation is low enough to classify the area as semiarid, it is important to note that about 70 percent of the annual total precipitation normally falls during the April to

September growing season. It is for this reason that Toole County is a fairly productive small-grain growing region of Montana. The combination of ideal temperatures during the growing season, long hours of summer sunshine, and 7 to 10 inches of precipitation during May to September make the climate favorable for dryland farming. Heavy fog seldom occurs and is limited to about one or two days per month, and lasts only a small part of the day. Although the area does receive slight to moderate average wind speeds, strong or extremely strong winds of over 70 mph are not commonly observed. Normal visibility is excellent.

Temperature and Precipitation

(Recorded in the period 1912-77 at Dunkirk; 1961-1990 at Goldbutte and Sunburst; and 1958-89 at Shelby airport)

Month	Temperature						Precipitation					
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall	
				maximum temperature higher than--	minimum temperature lower than--			Less than--	More than--			
°F	°F	°F	°F	°F	Units	In	In	In		In		
DUNKIRK:												
January---	25.6	3.0	14.3	54	-33	2	0.39	0.19	0.60	1	5.1	
February--	31.8	8.8	20.3	58	-27	5	0.35	0.15	0.55	1	4.4	
March-----	39.9	16.6	28.2	66	-19	19	0.41	0.21	0.65	1	4.4	
April-----	54.1	27.3	40.7	80	2	119	0.79	0.25	1.24	2	2.9	
May-----	65.8	37.7	51.8	88	20	370	1.62	0.76	2.36	4	0.6	
June-----	72.5	45.3	58.9	95	31	563	2.54	1.28	3.63	6	0.0	
July-----	82.8	50.3	66.6	100	35	816	1.46	0.45	2.33	3	0.0	
August----	80.8	48.2	64.5	99	33	749	1.35	0.41	2.12	3	0.0	
September-	69.2	38.7	54.0	92	18	431	0.98	0.30	1.54	2	0.6	
October---	57.6	29.3	43.5	82	3	183	0.54	0.15	0.90	1	1.9	
November--	40.5	16.6	28.5	66	-17	20	0.35	0.11	0.57	1	3.7	
December--	30.2	8.0	19.1	57	-29	5	0.46	0.18	0.73	1	5.7	
Yearly:												
Average--	54.2	27.5	40.9	---	---	---	---	---	---	---	---	
Extreme--	108	-46	---	101	-36	---	---	---	---	---	---	
Total----	---	---	---	---	---	3,282	11.25	8.60	13.63	26	29.4	
GOLDBUTTE:												
January---	30.2	7.7	18.9	58	-32	14	0.40	0.17	0.59	1	9.8	
February--	36.0	13.1	24.6	61	-27	17	0.30	0.16	0.43	0	7.2	
March-----	42.7	19.8	31.2	67	-18	36	0.61	0.26	0.95	1	10.8	
April-----	54.7	29.4	42.1	80	2	150	0.96	0.34	1.47	3	8.5	
May-----	64.9	38.3	51.6	86	19	367	2.23	1.11	3.20	5	1.9	
June-----	73.2	45.7	59.4	92	30	583	2.62	1.13	3.89	5	0.0	
July-----	80.3	49.1	64.7	95	34	765	1.33	0.41	2.08	3	0.0	
August----	79.5	48.1	63.8	97	32	738	1.63	0.68	2.43	3	0.0	
September-	68.2	39.8	54.0	91	19	431	1.53	0.56	2.44	3	1.2	
October---	58.2	32.4	45.3	81	5	226	0.61	0.24	0.96	2	4.2	
November--	42.0	19.8	30.9	67	-18	43	0.40	0.13	0.65	1	6.4	
December--	32.1	10.8	21.4	59	-34	15	0.43	0.17	0.65	1	9.0	
Yearly:												
Average--	55.2	29.5	42.3	---	---	---	---	---	---	---	---	
Extreme--	105	-46	---	98	-36	---	---	---	---	---	---	
Total----	---	---	---	---	---	3,386	13.05	9.88	16.01	28	59.2	

Temperature and Precipitation--Continued

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have--		Average number of growing degree days*	2 years in 10 will have--			Average number of days with 0.10 inch or more snowfall	
				maximum temperature higher than--	minimum temperature lower than--		Average	Less than--	More than--		
				°F	°F		°F	In	In		In
SHELBY AIRPORT:											
January---	27.5	5.6	16.5	57	-29	9	0.27	0.10	0.43	0	0.6
February--	35.5	12.3	23.9	63	-22	12	0.23	0.06	0.37	0	0.3
March-----	43.3	19.3	31.3	69	-17	35	0.37	0.09	0.61	1	0.7
April-----	55.9	29.1	42.5	81	7	147	0.68	0.32	1.19	2	0.0
May-----	66.1	38.6	52.4	87	23	384	1.83	0.93	2.61	4	0.1
June-----	74.8	47.0	60.9	93	32	617	2.22	0.84	3.38	4	0.2
July-----	83.2	51.0	67.1	98	39	829	1.21	0.38	2.06	3	0.0
August-----	82.1	49.4	65.7	99	36	800	1.13	0.54	1.78	2	0.0
September--	70.3	39.7	55.0	92	22	453	0.91	0.22	1.45	2	0.0
October---	60.1	31.5	45.8	83	6	233	0.33	0.05	0.54	0	0.1
November--	41.3	18.2	29.8	68	-18	34	0.28	0.04	0.46	0	0.5
December--	31.2	9.5	20.3	58	-30	9	0.24	0.06	0.38	0	1.7
Yearly:											
Average--	55.9	29.3	42.6	---	---	---	---	---	---	---	---
Extreme--	106	-43	---	100	-33	---	---	---	---	---	---
Total----	---	---	---	---	---	3,562	9.70	6.79	11.87	18	4.3
SUNBURST:											
January---	34.5	14.6	24.6	57	-23	11	0.39	0.23	0.56	1	3.8
February--	34.7	13.1	23.9	62	-28	15	0.31	0.12	0.47	1	3.5
March-----	43.6	22.7	33.1	66	-7	34	0.64	0.15	1.03	1	4.4
April-----	57.8	31.7	44.8	82	9	198	0.92	0.30	1.43	2	4.3
May-----	66.8	40.3	53.5	89	23	425	2.22	1.22	3.10	5	1.1
June-----	74.6	47.2	60.9	96	34	626	2.20	1.07	3.17	5	0.0
July-----	81.4	51.3	66.3	98	38	807	1.34	0.41	2.09	3	0.0
August-----	80.0	50.7	65.4	96	36	773	1.43	0.51	2.20	3	0.0
September--	68.6	41.6	55.1	93	24	463	1.24	0.35	1.96	3	0.9
October---	57.9	33.4	45.7	82	6	237	0.58	0.19	0.93	1	2.4
November--	40.8	20.7	30.8	66	-13	36	0.42	0.17	0.69	1	3.9
December--	30.0	10.9	20.4	57	-30	8	0.42	0.21	0.64	1	4.3
Yearly:											
Average--	55.9	31.5	43.7	---	---	---	---	---	---	---	---
Extreme--	103	-39	---	100	-32	---	---	---	---	---	---
Total----	---	---	---	---	---	3,632	12.13	9.11	14.95	27	28.6

Freeze Dates in Spring and Fall

(Recorded in the period 1922-78 at Dunkirk, 1948-91 at Goldbutte, 1958-89 at Shelby airport, and 1980-91 at Sunburst)

Probability	Temperature		
	24 degrees F	28 degrees F	32 degrees F
DUNKIRK:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 17	May 30	June 19
2 years in 10 later than---	May 11	May 24	June 12
5 years in 10 later than---	Apr. 30	May 13	May 31
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 10	Sept. 5	Aug. 24
2 years in 10 earlier than-	Sept. 16	Sept. 10	Aug. 29
5 years in 10 earlier than-	Sept. 27	Sept. 20	Sept. 9
GOLDBUTTE:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 18	May 27	June 17
2 years in 10 later than---	May 13	May 23	June 12
5 years in 10 later than---	May 3	May 15	June 2
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 10	Sept. 4	Sept. 16
2 years in 10 earlier than-	Sept. 16	Sept. 9	Aug. 22
5 years in 10 earlier than-	Sept. 28	Sept. 20	Sept. 3

Freeze Dates in Spring and Fall--Continued

Probability	Temperature		
	24 degrees F	28 degrees F	32 degrees F
SHELBY AIRPORT:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 7	May 23	June 3
2 years in 10 later than---	May 1	May 18	May 30
5 years in 10 later than---	Apr. 22	May 8	May 21
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 16	Sept. 11	Sept. 1
2 years in 10 earlier than-	Sept. 22	Sept. 16	Sept. 5
5 years in 10 earlier than-	Oct. 3	Sept. 26	Sept. 12
SUNBURST:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 10	May 18	June 4
2 years in 10 later than---	May 5	May 14	May 29
5 years in 10 later than---	Apr. 26	May 5	May 19
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 23	Sept. 12	Sept. 2
2 years in 10 earlier than-	Sept. 28	Sept. 17	Sept. 7
5 years in 10 earlier than-	Oct. 8	Oct. 28	Oct. 17

Growing Season

(Recorded in the period 1922-78 at Dunkirk, 1948-91 at Goldbutte,
1958-89 at Shelby airport, 1980-91 at Sunburst)

Probability	Daily Minimum Temperature		
	Higher than 24 degrees F	Higher than 28 degrees F	Higher than 32 degrees F
	Days	Days	Days
DUNKIRK:			
9 years in 10-----	116	102	74
8 years in 10-----	124	109	83
5 years in 10-----	139	123	100
2 years in 10-----	154	136	116
1 year in 10-----	162	143	125
GOLDBUTTE:			
9 years in 10-----	113	103	67
8 years in 10-----	120	108	75
5 years in 10-----	135	119	91
2 years in 10-----	150	130	106
1 year in 10-----	157	136	114
SHELBY AIRPORT:			
9 years in 10-----	130	113	96
8 years in 10-----	137	119	102
5 years in 10-----	150	132	112
2 years in 10-----	163	144	123
1 year in 10-----	170	150	128
SUNBURST:			
9 years in 10-----	133	115	97
8 years in 10-----	141	123	104
5 years in 10-----	156	140	117
2 years in 10-----	170	156	130
1 year in 10-----	178	165	137

Formation and Classification of the Soils

This section relates the major factors of soil formation to the soils in the survey area and describes the system of soil classification. The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

Formation of the Soils

Soil is a natural, three-dimensional body on the earth's surface. It has properties that result from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over a period of time.

Although there are many different soils, each soil is the result of the interaction of the same five factors. These factors are the physical and chemical composition of the parent material, the effect of climate on the parent material, the kinds of plants and the organisms living in the soil, the relief of the land, and the length of time it took for the soil to form.

Within short distances the combination of these factors varies, and consequently the soils that form differ in fertility, productivity, and physical and chemical characteristics. In the following paragraphs the factors of soil formation are discussed as they relate to the soils in Toole County.

Climate

Climate, an active force in the formation of soils, is determined mainly by temperature and precipitation. In Toole County the winters are cold, the springs are cool and moist, and the summers are hot and dry. Arctic cold waves and gusty warm southwest winds are part of seasonal weather patterns. Erosion and alternate freezing and thawing break down rocks into material in which soils form. The weathered material is further broken down by chemical reactions such as solution and hydration.

The precipitation and temperature affect the kind and amount of vegetation that grows on the soil. Vegetation decays to produce organic matter in the soil. Soils that have cool temperatures and high precipitation generally contain more organic matter

and are dark in color. Soils with warm temperature and low precipitation generally contain less organic matter and are light in color.

The average annual precipitation ranges from about 10 to 14 inches on the glaciated uplands, and from about 15 to 22 inches in the Sweetgrass Hills. The average annual temperature ranges from 38 to 45 degrees F.

Living Organisms

Living organisms are active in the formation of soils. Plants, animals, insects, and micro-organisms affect gains or losses in organic matter, plant nutrients in the soil, and changes in porosity and structure.

Roots, rodents, and insects penetrate the soil and alter its structure. Leaves, roots, and entire plants that remain in the surface layer are changed to humus by microorganisms, chemicals in the soil, and by insects. Fungi and algae also contribute to the decomposition of bedrock. Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common rodents in the area are ground squirrels, badgers, prairie dogs, and rabbits.

The vegetation in the survey area consists mainly of short grasses, mid grasses, and shrubs on the plains; and of tall grasses, Douglas fir, and lodgepole pine in the Sweetgrass Hills.

Topography

Topography, or relief, is determined by glaciation and the age and resistance of geologic formations to erosion by wind and water. It influences soil development through its effect on drainage and runoff. Runoff water has carved deep valleys on eroded uplands of this survey area. These rugged areas contrast sharply with the smoother areas of the glacial till plain.

On uplands, the number and distinction of soil horizons generally decrease as the slope increases. Soils on steep slopes with rapid runoff have many characteristics similar to those of soils formed in arid climates. Nearly level to moderately sloping soils have the characteristics of soils that are the most common in Toole County. Examples of this general principle are

the Hillon soils that are moderately steep or steep and the Telstad soils that are nearly level to moderately sloping.

Parent Material

Most of the soils in Toole County formed in glacial till or in glacial outwash material. Some of the soils formed in alluvium derived from mixed sources, and other soils formed in material that weathered from shale, sandstone, limestone, or igneous rocks.

The soils that formed in glacial till, such as the Telstad or Joplin series, generally are loamy while the Scobey and Kevin series generally are clayey. Soils that formed in soft sandstone, such as the Cabbart and Delpoint series, generally are loamy; soils that formed in shale, such as the Neldore series, are clayey. The soils that formed in mixed alluvium derived from glacial till, sandstone, or shale, such as the Havre series, are loamy.

Many soils in the survey area have accumulated lime, sodium, and other salts from the parent material. The salts and sodium make these soils slightly to moderately saline or alkali, and limit the amount and kind of plant cover.

Time

The changes that take place in a soil over long periods of time are called soil genesis. Distinct horizons, or layers, develop in the soils as a result of these changes. The length of time that parent materials have been in place and exposed to climate and living organisms is generally reflected in the degree to which the soil profile has developed. The kinds and arrangement of layers are called the soil morphology, and they are described in terms of color, texture, structure, consistence, thickness, permeability, and chemistry.

Soils are classified as young to mature. The age of a soil is determined from the thickness of the A horizon, the content of clay and organic matter, the depth to which soluble material is leached, and the form and distribution of calcium carbonate and gypsum in the soil.

Young soils show very little profile development. Havre loam, a soil of the Entisol order, is an example of a young soil. It is on a flood plain adjacent to a flowing stream. The soil contains little organic matter with which to form an A horizon; it has little clay accumulation; and it has little translocation of carbonates within the profile.

The Evanston soil formed in parent material that is similar to that of the Havre loam but which is much older. These soils formed in alluvium on uplands. They contain enough organic matter to have a dark-colored

A horizon, a distinct clay accumulation in a Bt horizon, and nearly all of the carbonates have been leached to a depth of about 13 inches.

Many of the sloping and steep, shallow and very shallow soils appear to have been in the process of formation for about as long as some of the more developed, less sloping soils. However, erosion has removed the soil as fast as it formed. In this case the effect of time has been offset by the effect of relief.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Boroll (Bor, meaning cool, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiborolls (*Argi*, meaning having an argillic horizon, plus *boroll*, the suborder of the Mollisols that have a cool climate).

SUBGROUP. Each great group has a typical subgroup. Other subgroups are intergrades or extragrades. The *typic* is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies

the subgroup that typifies the great group. An example is Typic Argiborolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A

family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed Typic Argiborolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series. An example is the Williams series.

Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Absher-----	Fine, montmorillonitic Typic Natriboralfs
*Acel-----	Fine, montmorillonitic Mollic Eutroboralfs
Assinniboine-----	Fine-loamy, mixed Aridic Argiborolls
Attewan-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Bascovy-----	Fine, montmorillonitic, frigid Leptic Udic Haplusterts
Bearpaw-----	Fine, montmorillonitic Typic Argiborolls
Benz-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Bigsag-----	Fine, montmorillonitic (calcareous), frigid Typic Halaquepts
Bigsandy-----	Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents
Blanchard-----	Mixed, frigid Typic Ustipsamments
Brockway-----	Fine silty, mixed, frigid Calciorthidic Ustochrepts
Busby-----	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Cabba-----	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart-----	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Chinook-----	Coarse-loamy, mixed Aridic Haploborolls
Cozberg-----	Coarse-loamy, mixed Aridic Haploborolls
Creed-----	Fine, montmorillonitic Typic Natriboralfs
Daglum-----	Fine, montmorillonitic Vertic Natriborolls
Dast-----	Coarse-loamy, mixed, frigid Typic Ustochrepts
Degrad-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Delpoint-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Doney-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Elloam-----	Fine, montmorillonitic Typic Natriboralfs
Enbar-----	Fine-loamy, mixed Cumulic Haploborolls
Ethridge-----	Fine, montmorillonitic Aridic Argiborolls
Evanston-----	Fine-loamy, mixed Aridic Argiborolls
Evanston, calcareous----	Fine-loamy, mixed Aridic Argiborolls
Fairway-----	Fine-loamy, mixed Fluvaquentic Haploborolls
Farnuf-----	Fine-loamy, mixed Typic Argiborolls
Ferd-----	Fine, montmorillonitic Glossic Eutroboralfs
Fleak-----	Mixed, frigid, shallow Aridic Ustipsamments
Flowerree-----	Fine-silty, mixed Aridic Haploborolls
Gerber-----	Fine, montmorillonitic Vertic Argiborolls
Gerdrum-----	Fine, montmorillonitic Typic Natriboralfs
Glendive-----	Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hanly-----	Sandy, mixed, frigid Aridic Ustifluvents
Harlake-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents
Havre-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hedstrom-----	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Hillon-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Joplin-----	Fine-loamy, mixed Aridic Argiborolls
Joplin, calcareous-----	Fine-loamy, mixed Aridic Argiborolls
Kenilworth-----	Fine-loamy, mixed Aridic Argiborolls
Kevin-----	Fine-loamy, mixed Aridic Argiborolls
Kevin, calcareous-----	Fine-loamy, mixed Aridic Argiborolls
Kiwanis-----	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Typic Ustifluvents
Kobase-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Korchea-----	Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents
Kremlin-----	Fine-loamy, mixed Aridic Haploborolls
Lambeth-----	Fine-silty, mixed (calcareous), frigid Aridic Ustorthents
Lihen-----	Sandy, mixed Entic Haploborolls
Lonna-----	Fine-silty, mixed, frigid Aridic Ustochrepts

Classification of the Soils--continued

Soil name	Family or higher taxonomic class
Macar-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Marias-----	Fine, montmorillonitic, frigid Chromic Udic Haplusterts
Marmarth-----	Fine-loamy, mixed Aridic Argiborolls
Marvan-----	Fine, montmorillonitic, frigid Sodic Haplusterts
Mckenzie-----	Fine, montmorillonitic, frigid Chromic Endoaquerts
Meadowcreek-----	Fine-loamy over sandy or sandy-skeletal, mixed Fluvaquentic Haploborolls
Neldore-----	Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents
Nesda-----	Sandy-skeletal, mixed Fluventic Haploborolls
Nesda, cool-----	Sandy-skeletal, mixed Fluventic Haploborolls
Nishon-----	Fine, montmorillonitic, frigid Typic Albaqualfs
Nobe-----	Fine, montmorillonitic (calcareous), frigid Oxyaquic Ustorthents
Nunemaker-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Perma-----	Loamy-skeletal, mixed Typic Haploborolls
Phillips-----	Fine, montmorillonitic Typic Eutroboralfs
Reeder-----	Fine-loamy, mixed Typic Argiborolls
Rivra-----	Sandy-skeletal, mixed, frigid Aridic Ustifluvents
Roy-----	Clayey-skeletal, mixed Typic Argiborolls
Ryell-----	Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Aridic Ustifluvents
Sagedale-----	Fine, montmorillonitic, frigid Typic Ustochrepts
Savage-----	Fine, montmorillonitic Typic Argiborolls
Scobey-----	Fine, montmorillonitic Aridic Argiborolls
Scobey, calcareous-----	Fine, montmorillonitic Aridic Argiborolls
Shambo-----	Fine-loamy, mixed Typic Haploborolls
Stemple-----	Loamy-skeletal, mixed Typic Paleboralfs
Sunburst-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Tally-----	Coarse-loamy, mixed Typic Haploborolls
Tanna-----	Fine, montmorillonitic Aridic Argiborolls
Telstad-----	Fine-loamy, mixed Aridic Argiborolls
Tinsley-----	Sandy-skeletal, mixed, frigid Typic Ustorthents
Trudau-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Turner-----	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Vaeda-----	Fine, montmorillonitic, nonacid, frigid Aridic Ustorthents
Vanda-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Vida-----	Fine-loamy, mixed Typic Argiborolls
Vida, calcareous-----	Fine-loamy, mixed Typic Argiborolls
Whitlash-----	Loamy-skeletal, mixed Lithic Haploborolls
Williams-----	Fine-loamy, mixed Typic Argiborolls
Yamacall-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Yetull-----	Mixed, frigid Typic Ustipsamments
Zahill-----	Fine-loamy, mixed (calcareous), frigid Typic Ustorthents
Zahl-----	Fine-loamy, mixed Typic Calciborolls

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
2A	Riverwash-----	213	*
4B	Brockway silt loam, 2 to 4 percent slopes-----	325	*
4C	Brockway silt loam, 4 to 8 percent slopes-----	279	*
12C	Tally sandy loam, 2 to 8 percent slopes-----	835	*
12D	Tally sandy loam, 8 to 15 percent slopes-----	219	*
13B	Tanna clay loam, 0 to 4 percent slopes-----	2,768	0.2
13C	Tanna clay loam, 4 to 8 percent slopes-----	579	*
14A	McKenzie silty clay, 0 to 1 percent slope-----	3,068	0.2
15F	Lambeth silt loam, 15 to 70 percent slopes-----	4,962	0.4
16B	Degradand loam, 0 to 4 percent slopes-----	4,219	0.3
19B	Kenilworth loam, 0 to 4 percent slopes-----	3,531	0.3
20C	Cabba loam, 4 to 8 percent slopes-----	704	*
20D	Cabba loam, 8 to 15 percent slopes-----	255	*
22E	Hillon clay loam, 8 to 25 percent slopes-----	3,024	0.2
22F	Hillon clay loam, 25 to 60 percent slopes-----	12,336	1.0
23A	Acel silty clay loam, 0 to 2 percent slopes-----	3,842	0.3
26B	Absher clay, 0 to 4 percent slopes-----	1,675	0.1
27B	Attewan loam, 0 to 4 percent slopes-----	1,883	0.2
28A	Nishon clay loam, 0 to 1 percent slope-----	7,517	0.6
29B	Nunemaker silty clay loam, 0 to 4 percent slopes-----	14,623	1.2
29C	Nunemaker silty clay loam, 4 to 8 percent slopes-----	2,667	0.2
30B	Marvan silty clay, 0 to 4 percent slopes-----	6,079	0.5
30C	Marvan silty clay, 4 to 8 percent slopes-----	698	*
32B	Kobase silty clay loam, 0 to 4 percent slopes-----	5,090	0.4
32C	Kobase silty clay loam, 4 to 8 percent slopes-----	1,644	0.1
33B	Phillips clay loam, 0 to 4 percent slopes-----	4,728	0.4
35B	Assinniboine fine sandy loam, 0 to 4 percent slopes-----	4,167	0.3
35C	Assinniboine fine sandy loam, 4 to 8 percent slopes-----	484	*
36C	Chinook loam, 0 to 8 percent slopes-----	1,212	*
37B	Evanston clay loam, 0 to 4 percent slopes-----	39,616	3.2
37C	Evanston clay loam, 4 to 8 percent slopes-----	1,452	0.1
38B	Ethridge clay loam, 0 to 4 percent slopes-----	10,520	0.8
39B	Ferd loam, 0 to 4 percent slopes-----	10,375	0.8
42B	Joplin clay loam, 0 to 4 percent slopes-----	50,034	4.0
42C	Joplin clay loam, 4 to 8 percent slopes-----	4,716	0.4
44B	Kevin clay loam, 0 to 4 percent slopes-----	30,989	2.5
44C	Kevin clay loam, 4 to 8 percent slopes-----	3,286	0.3
45C	Cozberg fine sandy loam, 2 to 8 percent slopes-----	1,654	0.1
45D	Cozberg fine sandy loam, 8 to 15 percent slopes-----	446	*
47B	Marias silty clay, 0 to 4 percent slopes-----	10,711	0.9
48B	Vanda silty clay, 0 to 4 percent slopes-----	7,033	0.6
48C	Vanda silty clay, 4 to 8 percent slopes-----	374	*
49C	Flowerree silt loam, 2 to 8 percent slopes-----	228	*
50B	Telstad clay loam, 0 to 4 percent slopes-----	2,849	0.2
51B	Turner loam, 0 to 4 percent slopes-----	1,739	0.1
53D	Sunburst clay loam, 8 to 15 percent slopes-----	281	*
53E	Sunburst clay loam, 15 to 25 percent slopes-----	3,720	0.3
53F	Sunburst clay loam, 25 to 70 percent slopes-----	2,637	0.2
54B	Trudau loam, 0 to 4 percent slopes-----	9,883	0.8
58B	Lonna silt loam, 0 to 4 percent slopes-----	2,345	0.2
59B	Hedstrom fine sandy loam, 0 to 4 percent slopes-----	413	*
60A	Havre silty clay loam, 0 to 2 percent slopes-----	821	*
62A	Vaeda silty clay loam, 0 to 2 percent slopes-----	4,226	0.3
64B	Nobe clay, 0 to 4 percent slopes-----	2,359	0.2
67B	Bearpaw clay loam, 0 to 4 percent slopes-----	1,308	0.1
68B	Gerber clay, 0 to 4 percent slopes-----	374	*
69A	Vida clay loam, 0 to 2 percent slopes-----	1,120	*
69C	Vida clay loam, 2 to 8 percent slopes-----	1,970	0.2
71F	Roy gravelly clay loam, 25 to 60 percent slopes-----	96	*
72F	Zahill loam, 25 to 45 percent slopes-----	3,603	0.3
73D	Yetull loamy fine sand, 0 to 15 percent slopes-----	2,575	0.2
74B	Shambo loam, 0 to 4 percent slopes-----	2,338	0.2

*See footnote at end of table

Acreeage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
75B	Farnuf clay loam, 0 to 3 percent slopes-----	8,045	0.6
75C	Farnuf clay loam, 3 to 8 percent slopes-----	1,945	0.2
77C	Tinsley gravelly sandy loam, 2 to 8 percent slopes-----	1,650	0.1
77E	Tinsley gravelly sandy loam, 8 to 25 percent slopes-----	575	*
79B	Yamacall loam, 0 to 4 percent slopes-----	3,424	0.3
79C	Yamacall loam, 4 to 8 percent slopes-----	1,692	0.1
79D	Yamacall loam, 8 to 15 percent slopes-----	1,507	0.1
80B	Williams clay loam, 0 to 3 percent slopes-----	4,059	0.3
80C	Williams clay loam, 3 to 8 percent slopes-----	2,350	0.2
82B	Savage silty clay loam, 0 to 3 percent slopes-----	3,357	0.3
85B	Benz clay loam, 0 to 4 percent slopes-----	770	*
88C	Perma gravelly loam, 2 to 8 percent slopes-----	2,196	0.2
88E	Perma gravelly loam, 8 to 25 percent slopes-----	1,008	*
90A	Harlake silty clay loam, 0 to 2 percent slopes-----	346	*
94C	Busby fine sandy loam, 2 to 8 percent slopes-----	4,313	0.3
94D	Busby fine sandy loam, 8 to 15 percent slopes-----	323	*
96C	Macar loam, 4 to 8 percent slopes-----	747	*
96D	Macar loam, 8 to 15 percent slopes-----	554	*
98B	Kremlin loam, 0 to 4 percent slopes-----	2,144	0.2
101A	Hanly-Glendive-Havre complex, 0 to 2 percent slopes-----	730	*
110A	Korchea-Kiwanis complex, 0 to 2 percent slopes-----	189	*
141A	McKenzie clay, saline, 0 to 2 percent slopes-----	1,874	0.2
143A	Meadowcreek loam, 0 to 2 percent slopes-----	167	*
144A	Big sandy silty clay loam, 0 to 1 percent slope-----	690	*
162B	Degrad sandy loam, 0 to 4 percent slopes-----	767	*
171F	Delpoint-Cabbart clay loams, 25 to 60 percent slopes-----	600	*
181D	Doney-Cabba complex, 4 to 15 percent slopes-----	385	*
191B	Kenilworth fine sandy loam, 0 to 4 percent slopes-----	5,737	0.5
200F	Badland-----	83	*
201F	Cabba-Rock outcrop complex, 25 to 70 percent slopes-----	2,463	0.2
202F	Cabba-Dast fine sandy loams, 25 to 45 percent slopes-----	2,233	0.2
203E	Cabba-Doney clay loams, 8 to 25 percent slopes-----	1,096	*
211F	Cabbart-Rock outcrop complex, 25 to 70 percent slopes-----	2,890	0.2
212F	Cabbart-Hillon complex, 25 to 45 percent slopes-----	1,915	0.2
213E	Cabbart-Delpoint loams, 8 to 25 percent slopes-----	718	*
221E	Hillon-Kevin clay loams, 15 to 25 percent slopes-----	1,163	*
222E	Hillon-Neldore complex, 8 to 25 percent slopes-----	8,917	0.7
222F	Hillon-Neldore complex, 25 to 70 percent slopes-----	19,338	1.6
224E	Hillon-Joplin loams, 8 to 25 percent slopes-----	11,218	0.9
241C	Marmarth-Evanston loams, 0 to 8 percent slopes-----	1,746	0.1
251C	Bascovy clay loam, 2 to 8 percent slopes-----	2,541	0.2
252D	Bascovy-Neldore clays, 8 to 15 percent slopes-----	885	*
261A	Absher-Nobe complex, 0 to 2 percent slopes-----	4,104	0.3
272B	Attewan sandy loam, 0 to 4 percent slopes-----	260	*
300F	Rubble land-----	1,702	0.1
311B	Creed-Gerdrum-Absher complex, 0 to 4 percent slopes-----	19,930	1.6
321B	Kobase silty clay loam, calcareous, 0 to 4 percent slopes-----	7,707	0.6
321C	Kobase silty clay loam, calcareous, 4 to 8 percent slopes-----	3,489	0.3
323C	Sagedale silty clay loam, 2 to 8 percent slopes-----	678	*
331B	Phillips-Elloam clay loams, 0 to 4 percent slopes-----	15,229	1.2
332B	Phillips-Kevin clay loams, 0 to 4 percent slopes-----	38,445	3.1
364C	Chinook fine sandy loam, 0 to 8 percent slopes-----	13,887	1.1
372B	Evanston fine sandy loam, 0 to 4 percent slopes-----	2,086	0.2
373C	Evanston-Tinsley complex, 2 to 8 percent slopes-----	289	*
374B	Evanston loam, 0 to 4 percent slopes-----	992	*
374C	Evanston loam, 4 to 8 percent slopes-----	585	*
378B	Evanston complex, 0 to 4 percent slopes-----	7,328	0.6
379C	Evanston-Busby complex, 2 to 8 percent slopes-----	896	*
384B	Ethridge silty clay loam, 0 to 4 percent slopes-----	3,717	0.3
386B	Ethridge-Evanston clay loams, 0 to 4 percent slopes-----	3,229	0.2
391B	Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes-----	9,323	0.7
391C	Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes-----	539	*

*See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
402A	Gerdrum-Absher complex, 0 to 2 percent slopes-----	15,281	1.2
411B	Reeder-Cabba complex, 0 to 4 percent slopes-----	1,280	0.1
411C	Reeder-Cabba complex, 4 to 8 percent slopes-----	2,166	0.2
421C	Joplin-Hillon clay loams, 2 to 8 percent slopes-----	41,552	3.3
421D	Joplin-Hillon clay loams, 8 to 15 percent slopes-----	23,838	1.9
423B	Joplin-Hillon clay loams, 0 to 3 percent slopes-----	24,630	2.0
423C	Hillon-Joplin clay loams, 3 to 8 percent slopes-----	37,658	3.0
424C	Joplin-Hillon gravelly loams, 3 to 8 percent slopes-----	3,750	0.3
425C	Joplin-Telstad clay loams, 2 to 8 percent slopes-----	1,287	0.1
426B	Joplin loam, 0 to 4 percent slopes-----	2,471	0.2
427B	Joplin complex, 0 to 4 percent slopes-----	74,784	6.0
427C	Joplin complex, 4 to 8 percent slopes-----	12,791	1.0
441C	Kevin-Hillon clay loams, 2 to 8 percent slopes-----	9,050	0.7
443B	Kevin-Ferd complex, 0 to 4 percent slopes-----	24,067	1.9
444B	Kevin, calcareous-Ferd complex, 0 to 4 percent slopes-----	1,675	0.1
445B	Kevin complex, 0 to 4 percent slopes-----	17,008	1.4
445C	Kevin complex, 4 to 8 percent slopes-----	4,911	0.4
446C	Kevin-Elloam clay loams, 2 to 8 percent slopes-----	2,103	0.2
451A	Cozberg-Lihen fine sandy loams, 0 to 2 percent slopes-----	810	*
451C	Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes-----	2,334	0.2
481A	Bigsag silty clay, 0 to 2 percent slopes-----	1,563	0.1
482A	Vanda-Marvan, saline, clays, 0 to 2 percent slopes-----	2,703	0.2
503B	Telstad-Joplin clay loams, 0 to 4 percent slopes-----	31,855	2.6
503C	Telstad-Joplin clay loams, 4 to 8 percent slopes-----	5,896	0.5
504B	Telstad-Joplin loams, 0 to 4 percent slopes-----	14,277	1.1
504C	Telstad-Joplin loams, 4 to 8 percent slopes-----	2,283	0.2
511C	Turner sandy loam, 2 to 6 percent slopes-----	685	*
521B	Elloam-Absher clay loams, 0 to 4 percent slopes-----	3,730	0.3
551E	Lihen-Blanchard loamy sands, 8 to 25 percent slopes-----	858	*
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes-----	40,655	3.3
561C	Scobey-Kevin clay loams, 4 to 8 percent slopes-----	2,511	0.2
561D	Scobey-Kevin clay loams, 8 to 15 percent slopes-----	996	*
563B	Scobey clay loam, 0 to 4 percent slopes-----	143	*
571A	Ryell-Rivra complex, 0 to 2 percent slopes-----	489	*
572A	Ryell-Havre loams, 0 to 2 percent slopes-----	45	*
581B	Lonna silty clay loam, 0 to 4 percent slopes-----	7,116	0.6
581C	Lonna silty clay loam, 4 to 8 percent slopes-----	1,054	*
582B	Lonna-Ethridge complex, 0 to 4 percent slopes-----	3,105	0.2
601A	Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded-----	7,381	0.6
603A	Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded-----	4,864	0.4
651E	Fleak-Lihen fine sandy loams, 8 to 25 percent slopes-----	207	*
673B	Bearpaw-Daglum clay loams, 0 to 4 percent slopes-----	2,127	0.2
691B	Vida-Vida, calcareous-Williams clay loams, 0 to 3 percent slopes-----	6,457	0.5
691C	Vida-Vida, calcareous-Williams clay loams, 3 to 8 percent slopes-----	24,572	2.0
692D	Vida, calcareous-Williams-Zahill clay loams, 4 to 15 percent slopes-----	14,386	1.2
694C	Vida-Williams clay loams, 3 to 8 percent slopes-----	28,592	2.3
695D	Vida-Williams-Zahill clay loams, 4 to 15 percent slopes-----	31,558	2.5
696E	Vida-Zahill clay loams, 8 to 25 percent slopes-----	15,921	1.3
697C	Vida-Bearpaw clay loams, 2 to 8 percent slopes-----	14,631	1.2
698D	Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes-----	5,994	0.5
698E	Vida-Zahill-Nishon clay loams, 0 to 25 percent slopes-----	458	*
721E	Zahill-Zahl complex, 15 to 25 percent slopes-----	5,695	0.4
721F	Zahill-Zahl complex, 25 to 60 percent slopes-----	15,749	1.3
722F	Zahill-Dast-Cabba complex, 25 to 65 percent slopes-----	848	*
743A	Shambo-Fairway loams, 0 to 2 percent slopes-----	2,019	0.2
761B	Fairway-Bigsandy loams, 0 to 4 percent slopes-----	1,687	0.1
793B	Yamacall loam, calcareous, 0 to 4 percent slopes-----	3,138	0.2
793C	Yamacall loam, calcareous, 4 to 8 percent slopes-----	3,958	0.3
793D	Yamacall loam, calcareous, 8 to 15 percent slopes-----	1,738	0.1
831B	Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes-----	205	*
861F	Stemple, high elevation-Rubble land complex, 25 to 70 percent slopes-----	1,167	*
862F	Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes-----	2,363	0.2

*See footnote at end of table

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
871B	Nesda complex, 0 to 4 percent slopes-----	227	*
881E	Perma-Whitlash cobbly loams, 8 to 25 percent slopes-----	1,500	0.1
881F	Perma-Whitlash cobbly loams, 25 to 70 percent slopes-----	11,072	0.9
942C	Busby-Chinook fine sandy loams, 2 to 8 percent slopes-----	1,768	0.1
961B	Macar clay loam, 0 to 4 percent slopes-----	238	*
971C	Neldore-Bascovy clays, 2 to 8 percent slopes-----	5,994	0.5
971F	Neldore-Bascovy clays, 8 to 45 percent slopes-----	7,266	0.6
972F	Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes-----	20,591	1.6
DA	Denied access-----	4,594	0.4
M-W	Miscellaneous water-----	30	*
W	Water-----	17,491	1.4
	Total-----	1,245,400	100.0

* Less than 0.1 percent.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each description is followed by the detailed soil map units associated with the series.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (*U.S. Dep. Agric., 1993*). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (*U.S. Dep. Agric, 1975*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed soil maps in Part III of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, are mapped without areas of minor components of other taxonomic classes. Consequently, map units are made up of the soils or miscellaneous areas for which they are named and some areas of minor components that belong to other taxonomic classes.

Minor components have properties and behavioral characteristics divergent enough to affect use or to

require different management. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, rarely flooded is a phase of the Havre series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Telstad-Joplin loams, 0 to 4 percent slopes is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Badland is an example.

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of the survey gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II, of this publication.

For general and detailed information about managing this map unit, see the following sections in Part II of this publication:

- "Range" section
- "Forest Land" section
- "Agronomy" section
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Absher Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Moderately well drained

Permeability: Very slow (less than 0.06 inch/hour)

Landform: Till plains, stream terraces, or alluvial fans

Parent material: Glacial till or alluvium

Slope range: 0 to 4 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Absher clay (mixed) in an area of Creed-Gerdrum-Absher complex, 0 to 4 percent slopes; in a rangeland

area, 1,400 feet south and 1,500 feet east of the northwest corner of sec. 17, T. 34 N., R. 2 W.

E—0 to 1 inch; grayish brown (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate very thin platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots and common very fine and fine pores; mildly alkaline; abrupt smooth boundary.

Btn—1 to 6 inches; light brownish gray (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium columnar structure; hard, firm, sticky and plastic; common very fine and fine roots and pores; common distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.

Btkn—6 to 13 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderately fine and medium prismatic structure; hard, firm, sticky and very plastic; few fine roots and few very fine and fine pores; common distinct clay films on faces of peds; common soft masses of lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

Btknyz—13 to 23 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; hard, firm very sticky and very plastic; few fine roots and pores; common distinct clay films on faces of peds; common soft masses of lime and gypsum; common fine and medium crystals of other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bnyz—23 to 36 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; few fine roots and pores; common medium nests of gypsum crystals; many fine and medium crystals of other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bnz—36 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark brownish gray (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; many fine and medium soft masses of salt; slightly effervescent; moderately alkaline.

Range in Characteristics

Control section: 1 to 21 inches

Content of clay in the control section: 35 to 60 percent

Depth to the Btknyz horizon: 6 to 20 inches

E horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Texture: Loam (where mixed with the Bt horizon, textures are mainly clay)
 Clay content: 15 to 55 percent
 Rock fragments: 0 to 30 percent pebbles and 0 to 5 percent cobbles
 Electrical conductivity: 4 to 8 mmhos/cm
 Reaction: pH 6.6 to 8.4
Note: Some pedons have a very thin A horizon.

Btn horizon

Hue: 2.5Y, 7.5YR, or 10YR
 Value: 4, 5, or 6 dry; 4 or 5 moist
 Chroma: 1, 2, or 3
 Texture: Silty clay, clay, or clay loam
 Clay content: 35 to 60 percent
 Structure: Moderate, strong columnar, or prismatic
 Consistence: Very hard or extremely hard when dry
 Rock fragments: 0 to 15 percent pebbles
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 18 to 70
 Reaction: pH 6.6 to 9.0

Btkn and Btknyz horizons

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 4, 5, or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: Clay loam, clay, or silty clay
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 20 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 16 to 30 mmhos/cm
 Sodium adsorption ratio: 18 to 70
 Gypsum content: 1 to 5 percent
 Reaction: pH 7.9 to 9.0

Bnyz and Bnz horizons

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Clay loam, sandy clay loam, silty clay, clay, or silty clay loam
 Clay content: 27 to 50 percent
 Rock fragments: 0 to 20 percent pebbles
 Calcium carbonate equivalent: 4 to 15 percent
 Electrical conductivity: 16 to 30 mmhos/cm
 Sodium adsorption ratio: 23 to 70
 Gypsum content: 1 to 5 percent
 Reaction: pH 7.9 to 9.0

Note: These horizons are slightly to violently effervescent; the lime is disseminated or in fine masses or threads; the gypsum, sodium sulfate, and other salts occur as few fine crystals to many fine masses; in some pedons, below 40 inches the soil is stratified with textures ranging from clay to loamy sand.

26B—Absher clay, 0 to 4 percent slopes***Setting***

Landform: Stream terraces
 Slope: 0 to 4 percent

Composition**Major Components**

Absher and similar soils: 85 percent

Minor Components

Absher clay loam: 0 to 10 percent
 Tinsley and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay
 Depth class: Very deep (more than 60 inches)
 Drainage class: Moderately well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.1 inches

261A—Absher-Nobe complex, 0 to 2 percent slopes***Setting***

Landform: Absher—alluvial fans and stream terraces;
 Nobe—alluvial fans and stream terraces
 Position on landform: Absher—microlows; Nobe—microhighs
 Slope: Absher—0 to 2 percent; Nobe—0 to 2 percent

Composition**Major Components**

Absher and similar soils: 45 percent
 Nobe and similar soils: 40 percent

Minor Components

Gerdrum and similar soils: 0 to 10 percent
 Somewhat poorly drained soils: 0 to 5 percent

Major Component Description**Absher**

Surface layer texture: Clay
 Depth class: Very deep (more than 60 inches)
 Drainage class: Moderately well drained
 Dominant parent material: Alluvium

Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.1 inches

Nobe

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Moderately well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.0 inches

Acel Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains or small drainageways
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Mollic
 Eutroboralfs

Typical Pedon

Acel silty clay loam, 0 to 2 percent slopes, in a cropland area, 2,600 feet south and 2,280 feet west of the northeast corner of sec. 32, T. 32 N., R. 2 W.

Ap—0 to 5 inches; brownish gray (10YR 6/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; massive; very hard, firm, sticky and plastic; few very fine and fine roots and tubular pores; neutral; abrupt smooth boundary.

Bt1—5 to 10 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine and fine roots and few fine pores; common distinct and prominent clay films on faces of peds and lining tubular pores; neutral; clear wavy boundary.

Bt2—10 to 22 inches; light brownish gray (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong medium and coarse subangular blocky structure; very hard, friable, sticky and

plastic; few fine roots and few very fine discontinuous pores; common distinct and prominent clay films on faces of peds and lining tubular pores; mildly alkaline; clear wavy boundary.

Bk1—22 to 36 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; very hard, friable, sticky and plastic; few fine roots and few very fine discontinuous pores; few fine irregularly shaped soft masses, filaments, and threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—36 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; very hard, friable, sticky and plastic; few fine roots and few very fine discontinuous pores; common fine irregularly shaped soft masses of lime on faces of peds; strongly effervescent; strongly alkaline.

Range in Characteristics

Control section: 5 to 22 inches

Content of clay in the control section: 40 to 55 percent

Depth to Bk horizon: 15 to 25 inches

Classification note: The Acel soil in Toole County is a taxadjunct to the series because of the dry value of 6 in the Ap horizon and it is outside the range of characteristics for the Mollic integrate; it classifies as a fine, montmorillonitic Typic Eutroboralf; these differences do not significantly affect use and management.

Ap horizon

Hue: 2.5Y or 10YR

Clay content: 27 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Note: This horizon is hard or very hard and massive when dry; some pedons have a thin E or transition horizon.

Bt horizons

Hue: 2.5Y or 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Silty clay or clay

Clay content: 40 to 55 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Note: The darker color values typically do not extend below the Bt1 horizon; the Bt horizons have a COLE of more than 0.06.

Bk horizons

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay loam, silty clay loam, or silty clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 15 percent—0 to 5 percent
cobbles, 0 to 15 percent pebbles

Calcium carbonate equivalent: 1 to 15 percent

Reaction: pH 7.9 to 9.0

Note: Some pedons have a By or Bky horizon
below 40 inches; some pedons do not have a
Bk horizon.**23A—Acel silty clay loam, 0 to 2 percent
slopes****Setting**

Landform: Till plains

Slope: 0 to 2 percent

Composition**Major Components**

Acel and similar soils: 90 percent

Minor Components

Gerdrum and similar soils: 0 to 4 percent

Nishon and similar soils: 0 to 2 percent

Evanston and similar soils: 0 to 2 percent

Ferd and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.4 inches

Assinniboine Series*Depth class:* Very deep (greater than 60 inches)*Drainage class:* Well drained*Permeability:* Moderate (0.6 to 2.0 inches/hour)*Landform:* Alluvial fans or stream terraces*Parent material:* Alluvium or eolian deposits*Slope range:* 0 to 8 percent*Annual precipitation:* 10 to 14 inches*Annual air temperature:* 42 to 45 degrees F*Frost-free period:* 105 to 125 days**Taxonomic Class:** Fine-loamy, mixed Aridic
Argiborolls**Typical Pedon**Assinniboine fine sandy loam, 0 to 4 percent slopes, in
a cropland area, 2,500 feet south and 2,050 feet west
of the northeast corner of sec. 2, T. 31 N., R. 1 W.Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam,
very dark brown (10YR 3/2) moist; weak fine
granular structure; slightly hard, very friable,
nonsticky and nonplastic; few very fine roots and
pores; neutral; abrupt smooth boundary.Bt—6 to 15 inches; brown (10YR 5/3) sandy clay
loam, dark brown (10YR 3/3) moist; moderate
medium prismatic structure; hard, friable, sticky
and plastic; few very fine roots and pores; many
faint clay films on faces of peds; neutral; clear
smooth boundary.Bk—15 to 30 inches; pale brown (10YR 6/3) fine
sandy loam, brown (10YR 5/3) moist; weak
medium prismatic structure; slightly hard, very
friable, slightly sticky and slightly plastic; few very
fine roots; few fine soft masses of lime; violently
effervescent; moderately alkaline; gradual wavy
boundary.BC—30 to 60 inches; brown (10YR 5/3) fine sandy
loam, dark yellowish brown (10YR 4/4) moist;
massive; soft, loose, nonsticky and nonplastic;
strongly effervescent; moderately alkaline.**Range in Characteristics***Control section:* 6 to 15 inches*Mollic epipedon thickness:* 7 to 15 inches*Content of clay in the control section:* 18 to 27 percent*Depth to Bk horizon:* 14 to 25 inches**Ap horizon**

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Rock fragments: 0 to 25 percent pebbles

Clay content: 5 to 15 percent

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Sandy clay loam or fine sandy loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 2.5Y or 10YR

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4
 Texture: Sandy loam, fine sandy loam, or sandy clay loam
 Clay content: 10 to 27 percent
 Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4
Note: Some pedons have a Btk horizon.

BC horizon

Hue: 2.5Y or 10YR
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: Fine sandy loam, sandy loam, loamy fine sand, or fine sand, or stratifications of these textures
 Clay content: 0 to 15 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 7.4 to 8.4

35B—Assinniboine fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
 Slope: 0 to 4 percent

Composition

Major Components

Assinniboine and similar soils: 85 percent

Minor Components

Assinniboine sandy clay loam: 0 to 5 percent
 Evanston and similar soils: 0 to 5 percent
 Lihen and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 5.9 inches

35C—Assinniboine fine sandy loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
 Slope: 4 to 8 percent

Composition

Major Components

Assinniboine and similar soils: 85 percent

Minor Components

Assinniboine sandy clay loam: 0 to 5 percent
 Evanston and similar soils: 0 to 5 percent
 Lihen and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 5.9 inches

Attewan Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour) to 27 inches; rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Relict stream terraces, outwash plains, or eskers
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls

Typical Pedon

Attewan sandy loam, 0 to 4 percent slopes, in a rangeland area, 300 feet south and 300 feet west of the northeast corner of sec. 9, T. 33 N., R. 2 E.

A—0 to 4 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine angular blocky structure parting to weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and many fine discontinuous pores; neutral; abrupt smooth boundary.

Bt1—4 to 7 inches; brown (10YR 5/3) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly

plastic; many fine roots and continuous pores; few faint clay films on faces of peds; neutral; gradual wavy boundary.

- Bt2**—7 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium prismatic structure parting to strong medium subangular blocky structure; hard, firm, sticky and plastic; many fine and medium roots and many fine pores; common faint clay films on faces of peds; neutral; gradual wavy boundary.
- Bk1**—12 to 18 inches; very pale brown (10YR 7/3) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots and pores; common medium soft masses and seams of lime; 10 percent pebbles; violently effervescent; strongly alkaline; gradual wavy boundary.
- Bk2**—18 to 27 inches; brown (10YR 5/3) gravelly sandy clay loam, very dark brown (10YR 4/2) moist; moderate medium angular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine and medium roots and common fine pores; 20 percent pebbles; common medium soft masses and seams of lime; violently effervescent; strongly alkaline; abrupt wavy boundary.
- 2C**—27 to 60 inches; brown (10YR 5/3) very gravelly sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; 55 percent pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 4 to 12 inches
Mollic epipedon thickness: 7 to 12 inches
Content of clay in the control section: 20 to 35 percent
Depth to Bk horizon: 10 to 21 inches
Depth to 2C horizon: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 4 or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Texture: Loam or sandy loam
 Clay content: 10 to 20 percent
 Rock fragments: 0 to 50 percent—0 to 20 percent greater than 3-inch stones and cobbles, 0 to 30 percent less than 3-inch pebbles
 Reaction: pH 6.1 to 7.3

Bt horizons

Hue: 10YR or 2.5Y
 Value: 4, 5, or 6 dry; 3 or 4 moist
 Chroma: 2 or 3
 Texture: Clay loam, sandy clay loam, or loam

Clay content: 20 to 35 percent
 Rock fragments: 0 to 25 percent—0 to 5 percent greater than 3-inch stones and cobbles, 0 to 20 percent less than 3-inch pebbles
 Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 10YR or 2.5Y
 Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 2, 3, 4, or 6
 Texture: Loam, clay loam, silt loam, sandy clay loam, or sandy loam
 Clay content: 15 to 30 percent
 Rock fragments: 0 to 30 percent—0 to 5 percent stones and cobbles, 0 to 25 percent pebbles
 Reaction: pH 7.4 to 9.0

2C horizon

Hue: 2.5Y or 10YR
 Value: 4, 5, or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: Loamy sand, sand, loamy coarse sand, or coarse sand
 Clay content: 0 to 10 percent
 Rock fragments: 35 to 75 percent—0 to 15 percent stones and cobbles, 35 to 60 percent pebbles
 Reaction: pH 7.4 to 9.0

27B—Attewan loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces
 Slope: 0 to 4 percent

Composition

Major Components

Attewan and similar soils: 85 percent

Minor Components

Attewan sandy loam: 0 to 5 percent
 Tinsley and similar soils: 0 to 5 percent
 Evanston and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 4.9 inches

272B—Attewan sandy loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Composition

Major Components

Attewan and similar soils: 85 percent

Minor Components

Degrad and similar soils: 0 to 5 percent

Tinsley and similar soils: 0 to 5 percent

Attewan sandy loam, calcareous: 0 to 5 percent

Major Component Description

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.7 inches

200F—Badland

Composition

Major Components

Badland: 85 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent

Hillon and similar soils: 0 to 10 percent

Major Component Description

Definition: Steep or very steep, barren land dissected by many intermittent drainage channels

Bascovy Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Very slow (less than 0.06 inch/hour)

Landform: Sedimentary plains or hills

Parent material: Residuum derived from shale

Slope range: 2 to 45 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Udorthentic Chromusterts

Typical Pedon

Bascovy clay loam, 2 to 8 slopes, in a rangeland area, 1,800 feet north and 2,350 feet west of the southeast corner of sec. 30, T. 34 N., R. 1 W.

A—0 to 4 inches; light gray (10YR 6/1) clay loam, gray (10YR 5/1) moist; moderate medium granular structure; hard, firm, sticky and plastic; many very fine roots and many fine pores; mildly alkaline; clear smooth boundary.

Bss1—4 to 13 inches; light gray (10YR 6/1) clay, gray (10YR 5/1) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots and pores; few slickensides intersecting at 45 degrees from the horizontal; mildly alkaline; gradual smooth boundary.

Bss2—13 to 21 inches; light gray (10YR 6/1) clay, gray (10YR 5/1) moist; weak fine subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine roots; few slickensides intersecting at 45 degrees from the horizontal; mildly alkaline; gradual wavy boundary.

C—21 to 30 inches; light gray (10YR 6/1) clay, gray (10YR 5/1) moist; massive; hard, firm, very sticky and very plastic; few very fine roots; 20 percent soft shale chips; neutral; gradual wavy boundary.

Cr—30 to 60 inches; gray (10YR 6/1) and reddish yellow (7.5YR 6/8); hard platy shale; neutral.

Range in Characteristics

Control section: 10 to 30 inches

Content of clay in the control section: 45 to 60 percent

Depth to bedrock: 20 to 40 inches

Note: Bascovy soils in Toole County are a taxadjunct to the Bascovy series by having chromas less than 2 derived from the shale parent material; they classify as Udorthentic Pellusterts; this does not affect use and management of the soil.

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Texture: Clay or clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.6 to 8.4

Bss horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Clay or silty clay
 Clay content: 40 to 60 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Reaction: pH 6.1 to 8.4

C horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1 or 2
 Texture: Clay or silty clay
 Clay content: 40 to 60
 Electrical conductivity: 0 to 8 mmhos/cm
 Reaction: 5.1 to 8.4

Note: Some pedons have a By horizon.

Cr horizon

Reaction: 5.1 to 8.4

251C—Bascovy clay loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
 Slope: 2 to 8 percent

Composition

Major Components

Bascovy and similar soils: 85 percent

Minor Components

Neldore and similar soils: 0 to 5 percent
 Marvan and similar soils: 0 to 5 percent
 Bascovy clay: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained
 Dominant parent material: Shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 4.6 inches

252D—Bascovy-Neldore clays, 8 to 15 percent slopes

Setting

Landforms: Bascovy—hills; Neldore—hills
Position on landforms: Bascovy—foot slopes;
 Neldore—shoulders
 Slope: Bascovy—8 to 15 percent; Neldore—8 to 15 percent

Composition

Major Components

Bascovy and similar soils: 50 percent
 Neldore and similar soils: 35 percent

Minor Components

Marvan and similar soils: 0 to 5 percent
 Soils that have slopes more than 15 percent:
 0 to 5 percent
 Rock outcrop: 0 to 5 percent

Major Component Description

Bascovy

Surface layer texture: Clay
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained
 Dominant parent material: Shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 4.5 inches

Neldore

Surface layer texture: Clay
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.6 inches

Bearpaw Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 8 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine, montmorillonitic Typic Argiborolls

Typical Pedon

Bearpaw clay loam, 0 to 4 percent slopes, in a cropland area, 1,300 feet north and 50 feet east of the southwest corner of sec. 20, T. 37 N., R. 4 W.

Ap—0 to 6 inches; grayish brown (2.5Y 4/2) clay loam, dark brown (10YR 3/3) moist; weak fine granular

structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; mildly alkaline; abrupt smooth boundary.

Bt1—6 to 13 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure; very hard, firm, sticky and plastic; common very fine roots and discontinuous pores; common distinct clay films on faces of peds; slightly effervescent; mildly alkaline; gradual smooth boundary.

Bt2—13 to 20 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common distinct clay films on faces of peds; slightly effervescent; mildly alkaline; gradual smooth boundary.

Bk—20 to 60 inches; light grayish brown (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common fine soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Control section: 6 to 20 inches

Mollic epipedon thickness: 7 to 12 inches

Content of clay in the control section: 35 to 50 percent

Ap horizon

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 6.1 to 7.8

Bt1 horizon

Value: 4 or 5 dry; 3 moist

Chroma: 2 or 3

Texture: Clay loam or loam

Clay content: 27 to 35 percent

Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.8

Bt2 horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 35 to 50 percent

Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam, silty clay loam, or clay

Clay content: 30 to 45 percent

Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

67B—Bearpaw clay loam, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Composition

Major Components

Bearpaw and similar soils: 85 percent

Minor Components

Vida and similar soils: 0 to 2 percent

Nishon and similar soils: 0 to 2 percent

Daglum and similar soils: 0 to 3 percent

Vida clay loam, calcareous: 0 to 3 percent

Soils that have slopes more than 4 percent:
0 to 5 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.7 inches

673B—Bearpaw-Daglum clay loams, 0 to 4 percent slopes

Setting

Landforms: Bearpaw—till plains; Daglum—till plains

Position on landform: Daglum—microlows

Slope: Bearpaw—2 to 4 percent; Daglum—0 to 2 percent

Composition

Major Components

Bearpaw and similar soils: 65 percent

Daglum and similar soils: 30 percent

Minor Components

Vida and similar soils: 0 to 3 percent

Nishon and similar soils: 0 to 2 percent

Major Component Description

Bearpaw

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.7 inches

Daglum

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 7.3 inches

Benz Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Alluvial fans

Parent material: Alluvium

Slope range: 0 to 4 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents

Typical Pedon

Benz clay loam, 0 to 4 percent slopes, in a rangeland area, 2,500 feet north and 1,800 feet west of the southeast corner of sec. 34, T. 36 N., R. 3 W.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate thin platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—4 to 8 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; common fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; disseminated lime; slightly effervescent; mildly alkaline; clear smooth boundary.

C2—8 to 20 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots and few very fine pores; disseminated lime; few fine and medium soft masses of gypsum; slightly effervescent; moderately alkaline; gradual wavy boundary.

C3—20 to 30 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; disseminated lime; few fine and medium soft masses of gypsum and other salts; strongly effervescent; moderately alkaline; gradual wavy boundary.

C4—30 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few very fine roots and pores; common fine and medium soft masses of gypsum and other salts; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 18 to 35 percent

A horizon

Hue: 2.5Y or 10YR

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 0 to 13

Reaction: pH 7.4 to 9.6

C horizons

Hue: 5Y, 2.5Y, or 10YR

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loam, clay loam, silt loam, or fine sandy loam

Clay content: 15 to 35 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 30

Calcium carbonate equivalent: 1 to 5 percent

Gypsum content: 1 to 2 percent

Reaction: pH 8.5 to 9.6

85B—Benz clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 4 percent

Composition

Major Components

Benz and similar soils: 85 percent

Minor Components

Vanda and similar soils: 0 to 5 percent
Yamac and similar soils: 0 to 5 percent
Soils that have slopes more than 4 percent:
0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: 6.8 inches

Bigzag Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Poorly drained
Permeability: Very slow (less than 0.06 inch/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Typic Halaquepts

Typical Pedon

Bigzag silty clay, 0 to 2 percent slopes, in a rangeland area, 200 feet south and 800 feet west of the northeast corner of sec. 30, T. 35 N., R. 2 W.

A—0 to 2 inches; light gray (10YR 6/1) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, very sticky and very plastic; common very fine and

fine roots and pores; mildly alkaline; clear smooth boundary.

Byzg1—2 to 16 inches; light gray (2.5YR 6/1) silty clay, gray (2.5YR 5/1) moist; common medium brownish yellow (10YR 6/6) dry mottles; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine and fine roots and common fine pores; common masses of gypsum and soluble salts; strongly effervescent; mildly alkaline; clear smooth boundary.

Byzg2—16 to 60 inches; light gray (2.5YR 6/1) silty clay, gray (2.5YR 5/1) moist; few fine faint brownish yellow (10YR 6/6) dry mottles; massive; hard, firm, sticky and plastic; few very fine and fine roots and pores; common fine seams and masses of gypsum and soluble salts; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 35 to 60 percent
Depth to seasonal high water table: 18 to 36 inches during the period from December to June

A horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 1 or 2
Clay content: 35 to 60 percent
Electrical conductivity: Greater than 16 mmhos/cm
Sodium absorption ratio: 13 to 20
Reaction: pH 7.9 to 9.0

Byzg1 horizon

Hue: 2.5Y or 5Y
Chroma: 1 or 2
Mottles: Abundance—none to common; Hue—2.5Y; Value—5 dry; 4 moist
Chroma: 3 or 4
Texture: Silty clay loam or silty clay
Clay content: 35 to 60 percent
Electrical conductivity: Greater than 16 mmhos/cm
Sodium absorption ratio: 13 to 40
Reaction: pH 8.4 to 9.0

Byzg2 horizon

Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Mottles: Abundance—common or many; Hue—2.5Y or 5Y; Value—5 dry, 4 moist; Chroma—3 or 4
Texture: Silty clay loam or silty clay
Clay content: 35 to 60 percent

Electrical conductivity: Greater than 16 mmhos/cm
Sodium absorption ratio: 13 to 30, decreasing with depth
Reaction: pH 8.4 to 9.0

481A—Bigsag silty clay, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Composition

Major Components

Bigsag and similar soils: 85 percent

Minor Components

Soils that are moderately saline: 0 to 10 percent
Soils that are somewhat poorly drained: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: 5.1 inches

Bigsandy Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Poorly drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents

Typical Pedon

Bigsandy silty clay loam, 0 to 1 percent slope, in a rangeland area, 800 feet south and 1,200 feet east of the northwest corner of sec. 33, T. 36 N., R. 1 E.

Oi—4 inches to 0; partially decomposed roots from grasses and sedges.

A—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure parting to moderate fine granular structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg1—5 to 10 inches; gray (5Y 5/1) clay loam, dark gray (5Y 4/1) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Cg2—10 to 32 inches; light gray (5Y 6/1) clay loam, gray (5Y 5/1) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, sticky and plastic; few very fine and fine roots and few fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg3—32 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, sticky and plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 18 to 35 percent

Depth to seasonal high water table: 12 to 24 inches during the period from December to June

A horizon

Hue: 2.5Y or 10YR

Value: 3 or 4 moist

Chroma: 1 or 2

Mottles: Abundance—none to few; Hue—2.5Y; Value—5 or 6 dry

Texture: Loam or silty clay loam

Clay content: 15 to 35 percent

Electrical conductivity: 2 to 25 mmhos/cm; saline phase 16 to 25 mmhos/cm

Reaction: pH 7.4 to 9.0

Note: When mixed to 7 inches the epipedon has moist value of 4.

Cg1 horizon

Hue: 5Y or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Mottles: Abundance—common or many; Hue—2.5Y or 10YR; Value—5 or 6 dry; 4 or 5 moist; Chroma—4 or 6
 Texture: Loam or silty clay loam consisting of strata of silt loam, clay loam, or fine sandy loam
 Clay content: 18 to 35 percent
 Electrical conductivity: 4 to 25 mmhos/cm; saline phase 16 to 25 mmhos/cm
 Reaction: pH 7.9 to 9.0

Cg2 horizon

Hue: 5Y or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1 or 2
 Mottles: Abundance—common or many; Hue—2.5Y or 10YR; Value—5 or 6 dry; 4 or 5 moist; Chroma—4 or 6
 Texture: Silt loam, silty clay loam, or clay loam consisting of strata of silt loam, fine sandy loam, fine sand, loamy sand, or clay
 Clay content: 15 to 35 percent
 Electrical conductivity: 8 to 25 mmhos/cm; saline phase 16 to 25 mmhos/cm
 Reaction: pH 7.9 to 9.0

144A—Bigsandy silty clay loam, 0 to 1 percent slopes

Setting

Landform: Flood plains
 Slope: 0 to 1 percent

Composition

Major Components

Bigsandy and similar soils: 85 percent

Minor Components

Savage and similar soils: 0 to 5 percent
 Korchea and similar soils: 0 to 10 percent

Major Component Description

Surface layer texture: Silty clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Poorly drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Rare
 Water table: Apparent
 Available water capacity: 8.0 inches

Blanchard Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Hills
Parent material: Eolian deposits
Slope range: 8 to 25 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Mixed, frigid Typic Ustipsamments

Typical Pedon

Blanchard loamy sand in an area of Lihen-Blanchard loamy sands, 8 to 25 percent slopes; in a rangeland area, 1,300 feet south and 1,400 feet west of the northeast corner of sec. 19, T. 36 N., R. 2 E.

- A—0 to 6 inches; brown (10YR 4/3) loamy sand, brown (10YR 3/3) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; mildly alkaline; clear smooth boundary.
- C1—6 to 20 inches; light brownish gray (10YR 6/2) loamy sand, dark brownish gray (10YR 4/2) moist; weak fine prismatic structure; soft, very friable, nonsticky and nonplastic; common very fine roots; strongly effervescent; mildly alkaline; clear smooth boundary.
- C2—20 to 36 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline; gradual wavy boundary.
- C3—36 to 60 inches; light brownish gray (2.5Y 6/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 0 to 5 percent
Note: Some pedons have strata of coarser sands mainly below 36 inches.

A horizon

Hue: 7.5YR, 10YR, or 2.5Y
 Value: 3, 4, 5, or 6 dry; 2, 3, or 4 moist
 Chroma: 2 or 3
 Clay content: 0 to 10 percent
 Reaction: pH 5.6 to 7.8

C horizons

Hue: 7.5YR, 10YR, or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Fine sand, loamy sand, or loamy fine sand
 Clay content: 0 to 5 percent
 Reaction: pH 6.6 to 8.4

Brockway Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inches/hour)
Landform: Alluvial fans
Parent material: Loess or alluvium
Slope range: 0 to 8 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-silty, mixed, frigid
 Calciorthidic Ustochrepts

Typical Pedon

Brockway silt loam, 2 to 4 percent slopes, in a cropland area, 2,200 feet south and 600 feet west of the northeast corner of sec. 33, T. 31 N., R. 1 W.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and tubular pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bk1—6 to 15 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium prismatic structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots and continuous pores; violently effervescent; many medium and coarse coatings of lime on faces of peds; moderately alkaline; clear smooth boundary.

Bk2—15 to 38 inches; light gray (2.5Y 7/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium prismatic structure; soft, very friable, nonsticky and nonplastic; few very fine and fine roots and few very fine continuous pores; strongly effervescent; few fine irregularly shaped seams of lime; moderately alkaline; gradual wavy boundary.

C—38 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine and fine roots and few very fine continuous pores; slightly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 18 to 35 percent

Depth to calcic horizon: 6 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 18 to 27 percent

Rock fragments: 0 to 8 percent—0 to 4 percent stones, 0 to 4 percent cobbles
 Reaction: pH 7.4 to 8.4

Note: In noncultivated areas the soils may have a thin A horizon 3 or 4 inches thick with color values of 4 or 5 dry and 3 moist.

Bk1 horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: Silt loam or loam
 Clay content: 18 to 27 percent
 Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y
 Value: 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Silt loam or silty clay loam
 Clay content: 18 to 35 percent
 Calcium carbonate equivalent: 15 to 40 percent
 Reaction: pH 7.9 to 9.0

C horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 5 or 6 moist
 Chroma: 2, 3, or 4
 Texture: Very fine sandy loam, silt loam, or silty clay loam (some thin silty clay layers may occur in some pedons)
 Clay content: 18 to 35 percent
 Electrical conductivity: Less than 4 mmhos/cm
 Calcium carbonate equivalent: 15 to 25 percent
 Reaction: pH 7.9 to 9.0

4B—Brockway silt loam, 2 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 4 percent

Composition

Major Components

Brockway and similar soils: 85 percent

Minor Components

Kobar and similar soils: 0 to 10 percent
Evanston and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 10.3 inches

4C—Brockway silt loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent

Composition

Major Components

Brockway and similar soils: 85 percent

Minor Components

Kobar and similar soils: 0 to 10 percent
Evanston and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 10.3 inches

Busby Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Alluvial fans
Parent material: Alluvium or eolian deposits
Slope range: 2 to 15 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy, mixed, frigid
Aridic Ustochrepts

Typical Pedon

Busby fine sandy loam, 2 to 8 percent slopes, in a cropland area, 1,200 feet north and 600 feet west of the southeast corner of sec. 27, T. 33 N., R. 3 W.

Ap—0 to 5 inches; grayish brown (10YR 5/3) fine sandy loam, brown 10YR 3/3) moist; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots and many very fine pores; neutral; abrupt smooth boundary.

Bw—5 to 13 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; slightly hard, friable, nonsticky and nonplastic; common very fine roots and pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—13 to 24 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots and pores; common fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—24 to 32 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; single grain: slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—32 to 60 inches; grayish brown (2.5Y 5/2) loamy sand, very dark grayish brown (2.5Y 3/2) moist; single grain; loose, nonsticky and nonplastic; few fine roots and tubular pores; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 10 to 18 percent

Note: Some pedons have a B_{ck} horizon.

A_p horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Clay content: 10 to 18 percent

Reaction: pH 7.4 to 8.4

Note: In some places the upper 3 inches of the soil has mollic colors but when mixed to 7 inches it does not meet the requirements for a mollic epipedon.

B_w horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 10 to 18 percent

Effervescence: None to strongly

Reaction: pH 7.4 to 8.4

B_k horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam or sandy loam

Clay content: 10 to 18 percent

Effervescence: Strongly to violently

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, loamy fine sand, loamy sand, or fine sand (the loamy fine sand, loamy sand, or fine sand textures are below depths of 40 inches)

Clay content: 3 to 18 percent

Effervescence: Slightly to violently

Reaction: pH 7.9 to 8.4

94C—Busby fine sandy loam, 2 to 8 percent slopes**Setting**

Landform: Alluvial fans
Slope: 2 to 8 percent

Composition**Minor Components**

Busby and similar soils: 85 percent

Major Components

Yetull and similar soils: 0 to 10 percent

Yamac and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 6.9 inches

94D—Busby fine sandy loam, 8 to 15 percent slopes**Setting**

Landform: Alluvial fans

Slope: 8 to 15 percent

Composition**Major Components**

Busby and similar soils: 85 percent

Minor Components

Yamac and similar soils: 0 to 5 percent

Chinook and similar soils: 0 to 3 percent

Yetull and similar soils: 0 to 3 percent

Soils that have slopes more than 15 percent: 0 to 4 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 6.9 inches

942C—Busby-Chinook fine sandy loams, 2 to 8 percent slopes**Setting**

Landforms: Busby—alluvial fans; Chinook—alluvial fans

Slope: Busby—2 to 8 percent; Chinook—2 to 8 percent

Composition

Major Components

Busby and similar soils: 50 percent
Chinook and similar soils: 35 percent

Minor Components

Yamac and similar soils: 0 to 10 percent
Yetull and similar soils: 0 to 5 percent

Major Component Description

Busby

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 6.9 inches

Chinook

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 7.4 inches

Cabba Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains, hills, or escarpments
Parent material: Residuum weathered from semiconsolidated interbedded sandstone and shale
Slope range: 2 to 70 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents

Typical Pedon

Cabba loam, in an area of Reeder-Cabba complex, 4 to 8 percent slopes; in a cropland area, 1,400 feet

south and 20 feet east of the northwest corner of sec. 28, T. 36 N., R. 4 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots and discontinuous pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

C—6 to 15 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure parting to weak medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots and discontinuous pores; strongly effervescent; mildly alkaline; diffuse smooth boundary.

Cr—15 to 60 inches; light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) semiconsolidated interbedded sandstone and shale.

Range in Characteristics

Control section: 10 to 15 inches

Content of clay in the control section: 20 to 35 percent

Depth to bedrock: 10 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 3, 4, 5, or 6 dry; 3 or 4 moist

Chroma: 1, 2, 3, or 4

Texture: Fine sandy loam, loam, or clay loam

Clay content: 10 to 35 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist

Chroma: 1, 2, 3, 4, or 6

Texture: Loam, silt loam, clay loam, or silty clay loam

Clay content: 20 to 35 percent

Structure: Massive, thin platy, subangular blocky, or prismatic

Rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles or channers

Calcium carbonate equivalent: 2 to 15 percent

Electrical conductivity: 0 to 8 mmhos/cm

Effervescence: Slight to violently

Reaction: pH 7.4 to 9.0

Cr horizon

Note: This horizon consists of interbedded layers

of silt, sand, and clay or a mixture of the three; they crush to loam, silt loam, very fine sandy loam, clay loam, or silty clay loam; some layers are harder than others, but all are considered rippable, or soft, and are readily dug with power tools.

Reaction: pH 7.4 to 8.4

Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.5 inches

20C—Cabba loam, 4 to 8 percent slopes

Setting

Landform: Sedimentary plains
 Slope: 4 to 8 percent

Composition

Major Components

Cabba and similar soils: 85 percent

Minor Components

Macar and similar soils: 0 to 10 percent
 Rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.5 inches

20D—Cabba loam, 8 to 15 percent slopes

Setting

Landform: Hills
 Slope: 8 to 15 percent

Composition

Major Components

Cabba and similar soils: 85 percent

Minor Components

Macar and similar soils: 0 to 10 percent
 Rock outcrop: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

202F—Cabba-Dast fine sandy loams, 25 to 45 percent slopes

Setting

Landforms: Cabba—hills; Dast—hills
 Position on landform: Cabba—back slopes; Dast—foot slopes
 Slope: Cabba—35 to 45 percent; Dast—25 to 35 percent

Composition

Major Components

Cabba and similar soils: 45 percent
 Dast and similar soils: 40 percent

Minor Components

Doney and similar soils: 0 to 5 percent
 Macar and similar soils: 0 to 5 percent
 Soils that have slopes more than 45 percent: 0 to 5 percent

Major Component Description

Cabba

Surface layer texture: Fine sandy loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.3 inches

Dast

Surface layer texture: Fine sandy loam
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained
 Dominant parent material: Semiconsolidated, sandy sedimentary beds
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 3.8 inches

203E—Cabba-Doney clay loams, 8 to 25 percent slopes

Setting

Landforms: Cabba—hills; Doney—hills
 Position on landform: Cabba—back slopes; Doney—foot slopes
 Slope: Cabba—8 to 25 percent; Doney—8 to 25 percent

Composition

Major Components

Cabba and similar soils: 50 percent
 Doney and similar soils: 35 percent

Minor Components

Macar and similar soils: 0 to 5 percent
 Soils that have noncalcareous surface layers: 0 to 5 percent
 Rock outcrop: 0 to 5 percent

Major Component Description

Cabba

Surface layer texture: Clay loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.4 inches

Doney

Surface layer texture: Clay loam
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 5.2 inches

201F—Cabba-Rock outcrop complex, 25 to 70 percent slopes

Setting

Landform: Hills
 Position on landform: Back slopes (fig. 2)
 Slope: 25 to 70 percent

Composition

Major Components

Cabba and similar soils: 60 percent
 Rock outcrop, mudstone: 25 percent

Minor Components

Cabba clay loam: 0 to 5 percent
 Doney and similar soils: 0 to 10 percent

Major Component Description

Cabba

Surface layer texture: Fine sandy loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.3 inches

Rock outcrop, mudstone

Definition: Surface exposures of mudstone

Cabbart Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Hills or escarpments
Parent material: Residuum weathered from semiconsolidated interbedded sandstone and shale
Slope range: 15 to 70 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Loamy, mixed (calcareous), frigid shallow Aridic Ustorthents

Typical Pedon

Cabbart loam in an area of Cabbart-Delpoint loams, 8 to 25 percent slopes; in a rangeland area, 750 feet south and 1,700 feet west of the northeast corner of sec. 34, T. 36 N., R. 1 W.

A—0 to 4 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; slightly hard, friable, sticky and plastic; few very fine roots and discontinuous pores; strongly effervescent; moderately alkaline; clear wavy boundary.



Figure 2. Typical area of Cabba-Rock outcrop complex, 25 to 70 percent slopes.

Bk—4 to 16 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; strong medium platy structure; hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—16 to 60 inches; dark gray (10YR 4/1) semiconsolidated interbedded sandstone and shale, dark grayish brown (10YR 4/2) moist; strongly effervescent; mildly alkaline.

Range in Characteristics

Control section: 10 to 16 inches

Content of clay in the control section: 18 to 35 percent

Depth to bedrock: 10 to 20 inches

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or fine sandy loam

Clay content: 10 to 35 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, silt loam, or silty clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 45 percent—0 to 15 percent hard pebbles, 0 to 45 percent soft pebbles

Electrical conductivity: 0 to 8 mmhos/cm

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.4 to 9.0

Cr horizon

Reaction: 7.4 to 8.4

213E—Cabbart-Delpoint loams, 8 to 25 percent slopes***Setting***

Landforms: Cabbart—hills; Delpoint—hills
 Position on landform: Cabbart—shoulders; Delpoint—
 foot slopes
 Slope: Cabbart—15 to 25 percent; Delpoint—8 to 15
 percent

Composition**Major Components**

Cabbart and similar soils: 45 percent
 Delpoint and similar soils: 40 percent

Minor Components

Fleak and similar soils: 0 to 5 percent
 Yamac and similar soils: 0 to 5 percent
 Rock outcrop: 0 to 5 percent

Major Component Description**Cabbart**

Surface layer texture: Loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and
 shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.8 inches

Delpoint

Surface layer texture: Loam
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and
 shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 3.9 inches

212F—Cabbart-Hillon complex, 25 to 45 percent slopes***Setting***

Landforms: Cabbart—hills; Hillon—hills (fig. 3)

Position on landform: Cabbart—back slopes; Hillon—
shouldersSlope: Cabbart—25 to 45 percent; Hillon—25 to 45
percent***Composition*****Major Components**

Cabbart and similar soils: 45 percent
 Hillon and similar soils: 40 percent

Minor Components

Yetull and similar soils: 0 to 10 percent
 Rock outcrop: 0 to 5 percent

Major Component Description**Cabbart**

Surface layer texture: Fine sandy loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone
 and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.7 inches

Hillon

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.9 inches

211F—Cabbart-Rock outcrop complex, 25 to 70 percent slopes***Setting***

Landform: Hills
 Position on landform: Back slopes
 Slope: 25 to 70 percent

Composition**Major Components**

Cabbart and similar soils: 60 percent
 Rock outcrop: 25 percent

Minor Components

Tinsley and similar soils: 0 to 10 percent
 Fleak and similar soils: 0 to 5 percent



Figure 3. Typical area of Cabbart-Hillon complex, 25 to 40 percent slopes.

Major Component Description

Cabbart

Surface layer texture: Fine sandy loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone
 and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.7 inches

Rock outcrop

Definition: Surface exposures of bare bedrock

Chinook Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)

Landform: Alluvial fans or stream terraces
Parent material: Alluvium or eolian deposits
Slope range: 0 to 8 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy, mixed, Aridic
 Haploborolls

Typical Pedon

Chinook fine sandy loam, 0 to 8 percent slopes, in a cropland area, 100 feet north and 1,750 feet east of the southwest corner of sec. 9, T. 33 N., R. 3 E.

Ap—0 to 6 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, friable, nonsticky and nonplastic; few very fine and fine roots and discontinuous pores; mildly alkaline; gradual smooth boundary.

Bw1—6 to 11 inches: brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots and pores; mildly alkaline; gradual wavy boundary.

Bw2—11 to 23 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure; slightly hard, friable, nonsticky and nonplastic; few very fine and fine roots and pores; mildly alkaline; gradual wavy boundary.

Bk—23 to 60 inches; light yellowish brown (10YR 5/4) fine sandy loam, light olive brown (10YR 4/3) moist; moderate medium prismatic structure; slightly hard, friable, nonsticky and nonplastic; few very fine roots and pores; few fine soft masses of lime; strongly effervescent; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 7 to 15 inches

Content of clay in the control section: 5 to 18 percent

Depth to Bk horizon: 12 to 35 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Texture: Fine sandy loam or loam

Clay content: 5 to 27 percent

Reaction: pH 6.6 to 8.4

Bw horizons

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent and more than 50 percent medium, fine, and coarser sand

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 9.0

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 15 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

364C—Chinook fine sandy loam, 0 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 8 percent

Composition

Major Components

Chinook and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 5 percent

Lihen and similar soils: 0 to 2 percent

Kobar and similar soils: 0 to 3 percent

Kremlin and similar soils: 0 to 3 percent

Busby and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 7.4 inches

36C—Chinook loam, 0 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 8 percent

Composition

Major Components

Chinook and similar soils: 85 percent

Minor Components

Lihen and similar soils: 0 to 10 percent

Trudau and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 7.6 inches

Cozberg Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderately rapid (2.0 to 6.0 inches/hour) to 30 inches; rapid below this depth (6.0 to 20.0 inches/hour)

Landform: Alluvial fans or hills

Parent material: Alluvium or eolian deposits

Slope range: 0 to 15 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy, mixed Aridic Haploborolls

Typical Pedon

Cozberg fine sandy loam in an area of Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes; in a cropland area, 200 feet south and 200 feet west of the northeast corner of sec. 14, T. 29 N., R. 1 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots and pores; mildly alkaline; abrupt smooth boundary.

Bw—8 to 18 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and few fine pores; mildly alkaline; gradual wavy boundary.

Bk—18 to 30 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 5/3) moist; weak coarse angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine roots and pores; common fine soft masses of lime; strongly effervescent; mildly alkaline; clear wavy boundary.

C—30 to 60 inches; grayish brown (10YR 5/2) loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 7 to 15 inches

Content of clay in the control section: 10 to 18 percent

Depth to 2C horizon: 20 to 40 inches

Ap horizon

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Value: 3 or 4 moist

Chroma: 2 or 3

Texture: Fine sandy loam, very fine sandy loam, or sandy loam

Clay content: 10 to 18 percent

Rock fragments: 0 to 15 percent

Reaction: pH 6.6 to 7.8

Bk horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Fine sandy loam, sandy loam, or very fine sandy loam

Clay content: 10 to 18 percent

Rock fragments: 0 to 15 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 6.6 to 7.8

2C horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loamy sand, sand, loamy coarse sand, or coarse sand

Clay content: 0 to 10 percent

Rock fragments: 0 to 35 percent pebbles

Reaction: pH 7.4 to 8.4

45C—Cozberg fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 2 to 8 percent

Composition**Major Components**

Cozberg and similar soils: 85 percent

Minor Components

Cozberg fine sandy loam, calc.: 0 to 5 percent

Degrad and similar soils: 0 to 5 percent

Kremlin and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.7 inches

45D—Cozberg fine sandy loam, 8 to 15 percent slopes**Setting**

Landform: Hills

Slope: 8 to 15 percent

Composition**Major Components**

Cozberg and similar soils: 85 percent

Minor Components

Degrad and similar soils: 0 to 5 percent

Lihen and similar soils: 0 to 5 percent

Soils that have slopes more than 15 percent:
0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.7 inches

451A—Cozberg-Lihen fine sandy loams, 0 to 2 percent slopes**Setting**

Landforms: Cozberg—alluvial fans; Lihen—alluvial fans

Slope: Cozberg—0 to 2 percent; Lihen—0 to 2 percent

Composition**Major Components**

Cozberg and similar soils: 50 percent

Lihen and similar soils: 35 percent

Minor Components

Kremlin and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Major Component Description**Cozberg**

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.7 inches

Lihen

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.5 inches

451C—Cozberg-Lihen fine sandy loams, 2 to 8 percent slopes**Setting**

Landforms: Cozberg—alluvial fans; Lihen—alluvial fans

Slope: Cozberg—2 to 8 percent; Lihen—2 to 8 percent

Composition

Major Components

Cozberg and similar soils: 50 percent
Lihen and similar soils: 35 percent

Minor Components

Kremlin and similar soils: 0 to 5 percent
Yetull and similar soils: 0 to 5 percent
Busby and similar soils: 0 to 5 percent

Major Component Description

Cozberg

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 4.7 inches

Lihen

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 5.5 inches

Creed Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans or stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic
Natriboralfs

Typical Pedon

Creed clay loam in an area of Creed-Gerdrum-Absher complex, 0 to 4 percent slopes; in a rangeland area, 2,000 east and 1,800 north of the southwest corner of sec. 17, T. 32 N., R. 1 E.

E—0 to 5 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak thin platy structure; slightly hard, friable, sticky and plastic; many very fine roots; mildly alkaline; abrupt smooth boundary.

Btn—5 to 12 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; strong medium columnar structure; very hard, firm, very sticky and plastic; few very fine roots and discontinuous pores; common faint clay films on faces of pedis; mildly alkaline; clear smooth boundary.

Bkn—12 to 24 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bknyz—24 to 33 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots and discontinuous pores; common medium soft masses of lime; common fine seams of salts; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bknyz—33 to 60 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse angular blocky structure; hard, firm, sticky and plastic; few fine soft masses of lime; common fine and medium seams and soft masses of gypsum and other salts; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 5 to 12 inches

Content of clay in the control section: 25 to 55 percent

Depth to the Bkn horizon: 10 to 20 inches

Depth to the Bknyz horizon: 22 to 36 inches

Note: Some pedons do not have a Bknyz horizon but have a Bkny, Bny, Bnz, Bknz, or C horizon.

E horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, 6, or 7 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Reaction: pH 6.1 to 8.4

Btn horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2 or 3
 Texture: Clay loam, silty clay loam, clay, or silty clay
 Clay content: 35 to 55 percent
 Electrical conductivity: 4 to 8 mmhos/cm; sandy substratum phase is 0 to 2 mmhos/cm
 Sodium absorption ratio: 8 to 20, pedons with SARs less than 13 have more exchangeable magnesium plus sodium than calcium plus exchangeable acidity at pH 8.2
 Reaction: pH 6.6 to 9.0

Bkn, Bknz, Bknyz horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Silty clay loam, clay loam, sandy clay loam, loam, or clay
 Clay content: 25 to 45 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 4 to 8 mmhos/cm
 Sodium absorption ratio: 13 to 20
 Gypsum: 0 to 2 percent
 Reaction: pH 7.9 to 9.0

311B—Creed-Gerdrum-Absher complex, 0 to 4 percent slopes

Setting

Landforms: Creed—alluvial fans and stream terraces;
 Gerdrum—alluvial fans and stream terraces;
 Absher—alluvial fans and stream terraces
 Position on landform: Creed—microhighs; Gerdrum—microlows; Absher—microlows
 Slope: Creed—0 to 4 percent; Gerdrum—0 to 4 percent; Absher—0 to 4 percent

Composition

Major Components

Creed and similar soils: 35 percent
 Gerdrum and similar soils: 30 percent
 Absher and similar soils: 20 percent

Minor Components

Ethridge and similar soils: 0 to 5 percent
 Evanston and similar soils: 0 to 5 percent
 Ferd and similar soils: 0 to 5 percent

Major Component Description

Creed

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 6.4 inches

Gerdrum

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.8 inches

Absher

Surface layer texture: Clay
 Depth class: Very deep (more than 60 inches)
 Drainage class: Moderately well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.1 inches

Daglum Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 2 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine, montmorillonitic Vertic
 Natriborolls

Typical Pedon

Daglum clay loam in an area of Bearpaw-Daglum clay loams, 0 to 4 percent slopes; in a rangeland area,

1,800 feet south and 300 feet west of the northeast corner of sec. 12, T. 37 N., R. 3 E.

A—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and common very fine tubular pores; neutral; abrupt smooth boundary.

E—6 to 9 inches; light brownish gray (10YR 6/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots and common very fine tubular pores; neutral; abrupt smooth boundary.

Btn1—9 to 14 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong fine and medium columnar structure parting to strong fine and medium angular blocky structure; extremely hard, very firm, very sticky and plastic; common very fine roots and vesicular pores; common faint clay films on faces of peds; moderately alkaline; clear smooth boundary.

Btn2—14 to 19 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; strong fine and medium prismatic structure parting to strong fine and medium angular blocky structure; extremely hard, very firm, very sticky and plastic; common very fine roots and tubular and vesicular pores; common faint clay films on faces of peds; moderately alkaline; gradual smooth boundary.

Bkn—19 to 35 inches; dark grayish brown (2.5Y 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine prismatic structure parting to weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots and tubular pores; many medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—35 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 9 to 19 inches

Mollic epipedon thickness: 7 to 16 inches

Content of clay in the control section: 35 to 60 percent

Depth to Bk horizon: 12 to 32 inches

Note: Soft sedimentary beds of shale, siltstone, or fine grained sandstone are below depths of 60 inches in some pedons.

A horizon

Hue: 10YR

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2

Reaction: pH 5.6 to 7.3

E horizon

Hue: 10YR or 2.5Y

Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1 or 2

Texture: Fine sandy loam, loam, silt loam, clay loam, or silty clay loam

Reaction: pH 5.6 to 7.3

Note: In some tilled pedons all of the E horizon has been mixed with the Ap horizon.

Btn horizons

Hue: 10YR or 2.5Y

Value: 3, 4, 5, or 6 dry; 2, 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, silty clay loam, or clay loam

Clay content: 35 to 60 percent

Structure: Strong columnar structure in the upper part grading to moderate or strong prismatic and blocky in the lower part

Reaction: pH 6.1 to 8.4 in the upper part; pH 7.9 to 9.0 in the lower part

Note: Some pedons have gypsum accumulation in the B and C horizons.

Bkn and C horizons

Hue: 2.5Y or 5Y

Value: 4, 5, 6, or 7 dry; 3, 4, 5, or 6 moist

Chroma: 1, 2, 3, or 4

Texture: Clay loam, silty clay, silty clay loam, or clay; is stratified in some pedons; texture of loam is allowed below a depth of 40 inches

Reaction: pH 7.4 to 9.0

Dast Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderately rapid (2.0 to 6.0 inches/hour)

Landform: Hills

Parent material: Residuum weathered from semiconsolidated sandstone

Slope range: 25 to 45 percent

Annual precipitation: 13 to 17 inches

Annual air temperature: 41 to 44 degrees F

Frost-free season: 90 to 105 days

Taxonomic Class: Coarse-loamy, mixed, frigid Typic Ustochrepts

Typical Pedon

Dast fine sandy loam in an area of Cabba-Dast fine sandy loams, 25 to 45 percent slopes, in rangeland, 1,900 feet south and 2,300 feet west of the northeast corner of sec. 30, T. 35 N., R. 4 W.

A—0 to 5 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; few very fine pores; violently effervescent; mildly alkaline; clear smooth boundary.

Bw—5 to 15 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 5/3) moist; weak medium prismatic structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; few very fine pores; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk—15 to 30 inches; light gray (10YR 7/2) fine sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; few fine soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Cr—30 to 60 inches; light gray (5Y 7/2) semiconsolidated sandstone, brown (10YR 5/3) moist; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 30 inches

Content of clay in the control section: 2 to 18 percent

Depth to semiconsolidated bedrock: 20 to 40 inches

Depth to Bk horizon: 13 to 24 inches

A horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 2 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 2 to 18 percent

Rock fragments: 0 to 15 percent pebbles
Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 2 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Cr horizon

Reaction: pH 7.4 to 8.4

Degrad Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to 24 inches; rapid below this depth (6.0 to 20.0 inches/hour)

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls

Typical Pedon

Degrad loam, 0 to 4 percent slopes, in a cropland area, 1,800 feet south and 1,400 feet west of the northeast corner of sec. 4, T. 34 N., R. 3 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and many fine discontinuous pores; neutral; abrupt smooth boundary.

Bt—5 to 14 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; strong fine prismatic structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and common fine tubular pores; few faint clay films on faces of peds; mildly alkaline; abrupt smooth boundary.

Bk—14 to 24 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist;

moderate fine and medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots and tubular pores; common medium soft masses of lime; violently effervescent; strongly alkaline; gradual smooth boundary.

C—24 to 60 inches; light grayish brown (2.5Y 6/2) loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline.

Range in Characteristics

Control section: 5 to 40 inches

Mollic epipedon thickness: 10 to 16 inches

Depth to Bk horizon: 12 to 23 inches

Depth to 2C horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Sandy loam or loam

Clay content: 10 to 20 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Note: Some pedons have an A horizon below the Ap horizon; thin surface horizons of 2 to 4 inches thick having a dry value of 4 are allowed; these horizons when mixed to 7 inches have a dry value of 5.

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam or sandy clay loam

Clay content: 20 to 35 percent (sand content 35 to 55 percent)

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Sandy clay loam, loam, or clay loam

Clay content: 15 to 30 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: Less than 4 mmhos/cm

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.4 to 9.0

2C horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Sand, coarse sand, fine sand, or loamy sand

Clay content: 0 to 5 percent

Rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.9 to 8.4

16B—Degrand loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Composition

Major Components

Degrad and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 10 percent

Degrad sandy loam: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.9 inches

162B—Degrand sandy loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces

Slope: 0 to 4 percent

Composition

Major Components

Degrad and similar soils: 85 percent

Minor Components

Lihen and similar soils: 0 to 7 percent
 McKenzie and similar soils: 0 to 1 percent
 Marmarth and similar soils: 0 to 7 percent

Major Component Description

Surface layer texture: Sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 4.7 inches

Delpoint Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sills or escarpments
Parent material: Residuum weathered from semiconsolidated interbedded sandstone and shale
Slope range: 8 to 35 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed, frigid Aridic Ustochrepts

Typical Pedon

Delpoint loam in an area of Cabbart-Delpoint loams, 8 to 25 percent slopes; in a rangeland area, 2,300 feet north and 2,100 feet east of the southwest corner of sec. 30, T. 34 N., R. 2 W.

- A—0 to 2 inches; grayish brown (10YR 5/2) loam, dark grayish brown (2.5YR 4/2) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots and many fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bw—2 to 11 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots and pores; strongly effervescent; strongly alkaline; clear wavy boundary.
- Bk—11 to 24 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak

coarse prismatic structure; hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots and many fine and very fine pores; many medium irregularly shaped soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—24 to 60 inches; gray (2.5Y 6/1) interbedded semiconsolidated sandstone and shale.

Range in Characteristics

Control section: 10 to 24 inches
Content of clay in the control section: 18 to 35 percent
Depth to semiconsolidated bedrock: 20 to 40 inches
Depth to Bk horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 3, 4, or 5 moist
 Chroma: 2, 3, or 4
 Texture: Loam or clay loam
 Clay content: 20 to 35 percent
 Rock fragments: 0 to 5 percent pebbles
 Reaction: pH 7.4 to 8.4
Note: When mixed to 7 inches the surface will not meet the requirements for a mollic epipedon.

Bw horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: Loam, clay loam, or silty clay loam
 Clay content: 18 to 35 percent clay
 Rock fragments: 0 to 15 percent pebbles
 Effervescence: None to violently
 Reaction: pH 6.6 to 9.0

Bk horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loam, sandy loam, clay loam, or silty clay loam
 Clay content: 18 to 35 percent clay
 Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 30 percent; there is not more than a 5 percent difference in calcium carbonate equivalent or by volume of secondary carbonates in the underlying horizon of material
 to meet the requirements of a calcic horizon
 Effervescence: Strongly or violently
 Reaction: pH 7.9 to 9.0

Cr horizon

Reaction: pH 7.9 to 9.0

171F—Delpoint-Cabbart clay loams, 25 to 60 percent slopes

Setting

Landforms: Delpoint—hills; Cabbart—hills
 Position on landform: Delpoint—foot slopes;
 Cabbart—back slopes
 Slope: Delpoint—25 to 35 percent; Cabbart—25 to 60 percent

Composition

Major Components

Delpoint and similar soils: 50 percent
 Cabbart and similar soils: 35 percent

Minor Components

Fleak and similar soils: 0 to 10 percent
 Rock outcrop: 0 to 5 percent

Major Component Description

Delpoint

Surface layer texture: Clay loam
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 3.8 inches

Cabbart

Surface layer texture: Clay loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.7 inches

DA—Denied access

Composition

Major Components

Denied access: 100 percent

Major Component Description

Definition: Areas where mapping access was denied by landowner

Doney Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Hills

Parent material: Residuum weathered from semiconsolidated interbedded sandstone and shale

Slope range: 4 to 25 percent

Annual precipitation: 13 to 17 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed, frigid Typic Ustochrepts

Typical Pedon

Doney clay loam in an area of Doney-Cabba complex, 4 to 15 percent slopes; in a rangeland area, 850 feet south and 1,100 feet east of the northwest corner of sec. 18, T. 35 N., R. 4 W.

A—0 to 5 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; few very fine roots and pores; strongly effervescent; mildly alkaline; clear smooth boundary.

Bw—5 to 18 inches; light gray (2.5Y 7/2) loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—18 to 32 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—32 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated interbedded sandstone and shale, grayish brown (10YR 5/2) moist; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 32 inches

Content of clay in the control section: 18 to 30 percent

Depth to semiconsolidated bedrock: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Clay content: 27 to 35 percent

Reaction: pH 6.6 to 8.4

Note: Uncultivated areas have a thin A horizon with a value of 5 or 6 dry; 3, 4, or 5 moist; chroma is 1, 2, or 3.

Bw horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 35 percent—0 to 10 percent cobbles, 0 to 25 percent pebbles

Calcium carbonate equivalent: Less than 15 percent

Reaction: pH 7.9 to 9.0

Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 30 percent—0 to 10 percent cobbles, 0 to 20 percent pebbles and channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

Cr horizon

Material: Semiconsolidated interbedded sandy and silty sedimentary beds

Reaction: pH 7.9 to 9.0

181D—Doney-Cabba complex, 4 to 15 percent slopes

Setting

Landforms: Doney—hills; Cabba—hills

Position on landform: Doney—back slopes;

Cabba—shoulders

Slope: Doney—4 to 15 percent; Cabba—4 to 15 percent

Composition

Major Components

Doney and similar soils: 55 percent

Cabba and similar soils: 30 percent

Minor Components

Soils that have noncalcareous surface layers: 0 to 5 percent

Dust and similar soils: 0 to 5 percent

Rock outcrop: 0 to 5 percent

Major Component Description

Doney

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.2 inches

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.5 inches

Elloam Series

Depth class: Very deep (greater than 60 inches)*Drainage class:* Well drained*Permeability:* Very slow (less than 0.06 inch/hour)*Landform:* Till plains*Parent material:* Glacial till*Slope range:* 0 to 8 percent*Annual precipitation:* 10 to 14 inches*Annual air temperature:* 42 to 45 degrees F*Frost-free period:* 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Elloam clay loam in an area of Kevin-Elloam clay loams, 2 to 8 percent slopes; in a cropland area, 1,100 feet north and 600 feet east of the southwest corner of sec. 18, T. 32 N., R. 1 W.

E—0 to 4 inches; light brownish gray (10YR 6/2) clay loam, brown (10YR 4/3) moist; moderate medium platy structure parting to moderate fine and medium granular structure; hard, very firm, sticky

and plastic; many very fine and fine roots and pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Btn1—4 to 11 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; strong medium columnar structure parting to strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; many fine roots and many very fine and fine pores; many distinct clay films on faces of peds and lining pores; slightly effervescent; mildly alkaline; clear wavy boundary.

Btn2—11 to 15 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to strong fine and medium angular blocky structure; hard, firm, very sticky and very plastic; many fine roots and many very fine and fine pores; many distinct clay films on faces of peds and lining pores; slightly effervescent; mildly alkaline; clear wavy boundary.

Btkn—15 to 24 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky structure; hard, firm, sticky and plastic; common distinct clay films on faces of peds and lining pores; few fine and medium soft masses of lime; strongly effervescent; mildly alkaline; clear wavy boundary.

Bknyz—24 to 35 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine roots and pores; few medium soft masses of lime; many medium filaments and soft masses of gypsum and other salts; strongly effervescent; mildly alkaline; clear wavy boundary.

Bnyz—35 to 60 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; massive; hard, very firm, very sticky and very plastic; common medium nests of gypsum and other salts; strongly effervescent; mildly alkaline.

Range in Characteristics

Control section: 4 to 25 inches

Content of clay in the control section: 35 to 55 percent

Depth to the Btkn horizon: 8 to 18 inches

Depth to the Bknyz horizon: 12 to 24 inches

E horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 30 to 45 percent where mixed to 7 inches and textures are clay loam or clay

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.1 to 7.8

Note: The surface layer is crusted in the natural state and is also crusted where cultivated.

Btn horizons

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 35 to 55 percent

Structure: Strong or medium columnar, prismatic, or blocky

Rock fragments: 0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles

Sodium absorption ratio: 8 to 25

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 6.6 to 9.0

Note: Pedons that have less than 15 percent ESP have more exchangeable Mg plus sodium than calcium, plus exchange acidity at pH 8.2.

Btkn horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 30 to 45 percent

Rock fragments: 0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles

Sodium absorption ratio: 13 to 25

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

Bknyz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Loam or clay loam

Clay content: 25 to 40 percent

Rock fragments: 0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles

Sodium absorption ratio: 13 to 25

Electrical conductivity: 8 to 16 mmhos/cm

Reaction: pH 7.9 to 9.0

Bnyz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Loam or clay loam

Clay content: 25 to 40 percent

Rock fragments: 0 to 15 percent—0 to trace cobbles, 0 to 15 percent pebbles

Sodium absorption ratio: 13 to 25

Electrical conductivity: 8 to 16 mmhos/cm
 Bulk density: 1.7 to 1.9 grams/cc
 Reaction: pH 7.9 to 9.0

521B—Elloam-Absher clay loams, 0 to 4 percent slopes

Setting

Landforms: Elloam—till plains; Absher—till plains
 Position on landform: Elloam—microhighs; Absher—microlows
 Slope: Elloam—0 to 4 percent; Absher—0 to 4 percent

Composition

Major Components

Elloam and similar soils: 50 percent
 Absher and similar soils: 40 percent

Minor Components

Phillips and similar soils: 0 to 5 percent
 Slickspots: 0 to 5 percent

Major Component Description

Elloam

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 6.6 inches

Absher

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Moderately well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.3 inches

Enbar Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat poorly drained

Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed Cumulic Haploborolls

Typical Pedon

Enbar loam in an area of Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes; in a rangeland area, 2,300 feet north and 1,000 feet east of the southwest corner of sec. 18, T. 37 N., R. 3 E.

- A1—0 to 6 inches; dark yellowish brown (10YR 4/4) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots and many very fine and fine pores; neutral; abrupt smooth boundary.
- A2—6 to 18 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure; slightly hard, friable, sticky and plastic; many very fine and few coarse roots and many very fine and fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- C—18 to 30 inches; very dark grayish brown (10YR 3/2) clay loam black (10YR 2/1) moist; moderate medium prismatic structure; hard, firm, sticky and plastic; many very fine roots and common very fine pores; strongly effervescent; moderately alkaline; clear wavy boundary.
- Cg1—30 to 42 inches; gray (10YR 5/1) loam, dark gray (10YR 4/1) moist; common fine faint reddish yellow (7.5YR 6/6) mottles; weak medium subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine roots and pores; strongly effervescent; moderately alkaline; gradual wavy boundary.
- Cg2—42 to 50 inches; light gray (10YR 6/1) loam, dark gray (10YR 4/1) moist; common fine distinct strong brown (7.5YR 5/6) mottles; massive; soft, friable, slightly sticky and slightly plastic; 5 percent pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.
- 2C—50 to 60 inches; grayish brown (10YR 5/2) gravelly loamy sand, dark grayish brown (10YR 4/2) moist; common fine prominent yellowish brown (10YR 5/8) mottles; single grain; soft, friable, slightly sticky and slightly plastic;

35 percent pebbles and 5 percent cobbles; slightly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 16 to 28 inches

Content of clay in the control section: 18 to 30 percent

Depth to seasonal water table: 30 to 60 inches

Depth to 2C horizon: 40 to 60 inches

A horizons

Hue: 5YR, 7.5YR, or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1, 2, 4, or 6

Clay content: 18 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Mottles: Abundance—few to common; Hue—10YR 5/4 or 10YR 4/4

Texture: Loam or clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: Strongly or violently

Reaction: pH 7.9 to 8.4

Cg horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 0, 1, or 2

Mottles: Abundance—few to common; Hue—10YR 3/4, 10YR 5/6, or 10YR 6/6

Texture: Loam with stratification of sandy loam, silty clay loam, or clay loam

Clay content: 18 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: Strongly or violently

Reaction: pH 7.9 to 8.4

2C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Mottles: Abundance—few to common; Hue—10YR 6/6 or 10YR 5/6

Texture: Sandy loam or loamy sand

Clay content: 5 to 18 percent

Rock fragments: 35 to 75 percent—0 to 5 percent cobbles, 35 to 70 percent pebbles

Effervescence: Strongly or violently

Reaction: pH 7.9 to 8.4

Note: Some pedons do not have a 2C horizon.

831B—Enbar-Bigsandy-Korchea loams, 0 to 4 percent slopes

Setting

Landforms: Enbar—flood plains; Bigsandy—flood plains; Korchea—flood plains

Slope: Enbar—0 to 4 percent; Bigsandy—0 to 2 percent; Korchea—0 to 4 percent

Composition

Major Components

Enbar and similar soils: 35 percent

Bigsandy and similar soils: 30 percent

Korchea and similar soils: 25 percent

Minor Components

Kiwanis and similar soils: 0 to 4 percent

Soils that are clayey: 0 to 3 percent

Soils that are frequently flooded: 0 to 3 percent

Major Component Description

Enbar

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Available water capacity: 8.7 inches

Bigsandy

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: 8.0 inches

Korchea

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare
Available water capacity: 10.3 inches

Ethridge Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans, stream terraces, and small drainageways
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Ethridge silty clay loam, 0 to 4 percent slopes, in a cropland area, 2,100 feet south and 20 feet west of the northeast corner of sec. 6, T. 30 N., R. 2 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and discontinuous pores; neutral; abrupt smooth boundary.

Bt—6 to 15 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong medium subangular blocky structure; very hard, firm, sticky and very plastic; many very fine and fine roots and common very fine and fine discontinuous pores; many distinct clay films on faces of peds; neutral; clear smooth boundary.

Bk1—15 to 27 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine and fine roots and many very fine discontinuous pores; few fine soft masses and filaments of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—27 to 38 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—38 to 60 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; massive; hard, friable, sticky and plastic; few fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 6 to 15 inches
Mollic epipedon thickness: 7 to 16 inches
Content of clay in the control section: 35 to 45 percent
Depth to Bk horizon: 10 to 20 inches

Ap horizon
Hue: 10YR or 2.5Y
Value: 2 or 3 moist
Chroma: 2 or 3
Texture: Clay loam or silty clay loam
Clay content: 20 to 35 percent
Rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.1 to 7.8

Bt horizon
Hue: 10YR or 2.5Y
Value: 3 or 4 moist
Chroma: 2, 3, or 4
Texture: Clay, silty clay, clay loam, or silty clay loam
Clay content: 35 to 45 percent
Rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 8.4

Bk horizons
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: Clay, silty clay loam, loam, clay loam, or silty clay
Clay content: 25 to 45 percent
Rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 9.0

BC horizon
Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: Clay loam, silt loam, or silty clay loam (these textures consist of strata of finer and coarser materials)
Clay content: 25 to 40 percent slopes
Rock fragments: 0 to 5 percent
Electrical conductivity: 0 to 4 mmhos/cm
Gypsum: 0 to 3 percent
Reaction: pH 7.4 to 8.4
Note: Some pedons this horizon may be stratified.

38B—Ethridge clay loam, 0 to 4 percent slopes***Setting***

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent

Composition**Major Components**

Ethridge and similar soils: 85 percent

Minor Components

Marias and similar soils: 0 to 5 percent
Marvan and similar soils: 0 to 5 percent
Vanda and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

384B—Ethridge silty clay loam, 0 to 4 percent slopes***Setting***

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent

Composition**Major Components**

Ethridge and similar soils: 85 percent

Minor Components

Marvan and similar soils: 0 to 4 percent
Vanda and similar soils: 0 to 4 percent
Acel and similar soils: 0 to 4 percent
Evanston and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium

Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

386B—Ethridge-Evanston clay loams, 0 to 4 percent slopes***Setting***

Landforms: Ethridge—alluvial fans, stream terraces, and drainageways; Evanston—alluvial fans, stream terraces, and drainageways
Slope: Ethridge—0 to 4 percent; Evanston—0 to 4 percent

Composition**Major Components**

Ethridge and similar soils: 50 percent
Evanston and similar soils: 35 percent

Minor Components

Soils that have calcareous surface layers: 0 to 5 percent
Acel and similar soils: 0 to 4 percent
Marvan and similar soils: 0 to 3 percent
Vanda and similar soils: 0 to 3 percent

Major Component Description**Ethridge**

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

Evanston

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

Evanston Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans, stream terraces, and small drainageways
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Evanston clay loam, 0 to 4 percent slopes, in a cropland area, 1,500 feet south and 2,200 feet east of the northwest corner of sec. 1, T. 33 N., R. 3 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and many fine pores; neutral; abrupt smooth boundary.

Bt—6 to 15 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong fine and medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; many fine and medium roots and many fine pores; common distinct clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Bk1—15 to 26 inches; pale brown (10YR 6/3) clay loam, light brownish gray (10YR 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and common fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—26 to 32 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots and common fine pores; common soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—32 to 60 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; common fine roots and few fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 6 to 15 inches
Mollic epipedon thickness: 7 to 15 inches
Content of clay in the control section: 25 to 35 percent
Depth to Bk horizon: 8 to 20 inches

Ap horizon
 Hue: 2.5Y through 7.5YR
 Value: 3, 4, or 5 dry; 2 or 3 moist
 Chroma: 2 or 3 dry or moist
 Texture: Loam, clay loam, or fine sandy loam
 Reaction: pH 6.6 to 7.8

Bt horizon
 Hue: 2.5Y through 7.5YR
 Value: 3, 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2, 3, or 4 dry or moist
 Texture: Clay loam, sandy clay loam, or loam, averaging 18 to 35 percent clay, and more than 15 percent sand but less than 35 percent fine or coarser sand
 Reaction: pH 7.4 to 8.4

Bk and C horizons
 Hue: 2.5Y through 7.5YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 3 or 4 dry or moist
 Texture: Loam, clay loam, or sandy clay loam
 Calcium carbonate equivalent: 6 to 14 percent
 Reaction: pH 7.9 to 8.4

37B—Evanston clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent

Composition

Major Components

Evanston and similar soils: 85 percent

Minor Components

Evanston clay loam, calcareous: 0 to 10 percent
 Chinook and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.9 inches

37C—Evanston clay loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans, stream terraces, and drainageways
 Slope: 4 to 8 percent

Composition**Major Components**

Evanston and similar soils: 85 percent

Minor Components

Evanston clay loam, calcareous: 0 to 10 percent
 Chinook and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.9 inches

378B—Evanston complex, 0 to 4 percent slopes**Setting**

Landforms: Evanston—alluvial fans, stream terraces, and drainageways; Evanston, calcareous—alluvial fans, stream terraces, and drainageways
 Slope: Evanston—0 to 4 percent;
 Evanston, calcareous—0 to 4 percent

Composition**Major Components**

Evanston and similar soils: 50 percent
 Evanston, calcareous and similar soils: 35 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 10 percent
 Evanston fine sandy loam: 0 to 5 percent

Major Component Description**Evanston**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.9 inches

Evanston, calcareous

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.9 inches

372B—Evanston fine sandy loam, 0 to 4 percent slopes**Setting**

Landforms: Alluvial fans, stream terraces, and drainageways
 Slope: 0 to 4 percent

Composition**Major Components**

Evanston and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 10 percent
 Chinook and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland

Flooding: None
Available water capacity: 9.9 inches

374B—Evanston loam, 0 to 4 percent slopes

Setting

Landforms: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent

Composition

Major Components

Evanston and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent: 0 to 10 percent
Evanston loam, calcareous: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 10.0 inches

374C—Evanston loam, 4 to 8 percent slopes

Setting

Landforms: Alluvial fans, stream terraces, and drainageways
Slope: 4 to 8 percent

Composition

Major Components

Evanston and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 10 percent
Evanston loam, calcareous: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 10.0 inches

379C—Evanston-Busby complex, 2 to 8 percent slopes

Setting

Landforms: Evanston—alluvial fans; Busby—alluvial fans
Slope: Evanston—2 to 8 percent; Busby—2 to 8 percent

Composition

Major Components

Evanston and similar soils: 50 percent
Busby and similar soils: 40 percent

Minor Components

Kremlin and similar soils: 0 to 4 percent
Yetull and similar soils: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Evanston

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

Busby

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 6.9 inches

373C—Evanston-Tinsley complex, 2 to 8 percent slopes

Setting

Landforms: Evanston—drainageways; Tinsley—kames and eskers

Slope: Evanston—2 to 4 percent; Tinsley—4 to 8 percent

Composition

Major Components

Evanston and similar soils: 70 percent

Tinsley and similar soils: 20 percent

Minor Components

Soils that have slopes more than 8 percent:
0 to 5 percent

Yetull and similar soils: 0 to 3 percent

Lihen and similar soils: 0 to 2 percent

Major Component Description

Evanston

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.9 inches

Tinsley

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Glacial outwash

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 1.2 inches

Fairway Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat poorly drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to 41 inches; rapid below this depth (6.0 to 20.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Fluvaquentic Haploborolls

Typical Pedon

Fairway loam in an area of Fairway-Bigsandy loams, 0 to 4 percent slopes; in a rangeland area, 700 feet south and 2,300 feet east of the northwest corner of sec. 18, T. 36 N., R. 2 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and pores; slightly effervescent; mildly alkaline; clear smooth boundary.

A2—3 to 10 inches; dark grayish brown (10YR 4/2) loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Cg1—10 to 30 inches; light gray (5Y 6/1) loam, dark gray (5Y 4/1) moist; slightly hard, friable, slightly hard and slightly plastic; many very fine and fine roots and pores; violently effervescent; moderately alkaline; clear smooth boundary.

Cg2—30 to 41 inches; gray (10YR 6/1) loam, dark gray (10YR 4/1) moist; few faint brownish yellow (10YR 6/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine and fine pores; violently effervescent; moderately alkaline; clear smooth boundary.

2Cg1—41 to 47 inches; gray (5Y 6/1) sand, dark gray (5Y 4/1) moist; few faint brownish yellow (10YR 6/6) mottles; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

2Cg2—47 to 60 inches; gray (5Y 6/1) sand, dark gray (5Y 4/1) moist; many prominent yellowish brown (10YR 5/6) mottles; single grain; loose, nonsticky and nonplastic; few very fine roots; slightly effervescent; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 10 to 15 inches

Content of clay in the control section: 18 to 30 percent

Depth to seasonal high water table: 36 to 60 inches

A1 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 1 or 2

Clay content: 15 to 25 percent

Electrical conductivity: 2 to 8

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 6.6 to 8.4

A2 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1, 2, or 3

Texture: Loam, silt loam, clay loam, or silty clay loam

Clay content: 18 to 20 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: Slightly to strongly

Electrical conductivity: 2 to 8

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 6.6 to 8.4

Cg horizons

Hue: 10YR or 2.5Y

Value: 6 dry; 3 or 4 moist

Chroma: 1, 2, or 3

Texture: Loam, silt loam, or silty clay loam with some thin strata of sandy loam, loamy sand, or clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: Slightly to strongly

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 6.6 to 8.4

2Cg horizons

Hue: 2.5Y or 5Y

Value: 6 dry; 3 or 4 moist

Chroma: 1 or 2

Texture: Sand, loamy sand, or sandy loam

Clay content: 0 to 10 percent

Rock fragments: 0 to 60 percent—0 to 5 percent cobbles, 0 to 55 percent pebbles

Effervescence: Slightly to strongly

Calcium carbonate equivalent: 0 to 15 percent

Reaction: pH 6.6 to 7.8

761B—Fairway-Bigsandy loams, 0 to 4 percent slopes**Setting**

Landforms: Fairway—flood plains; Bigsandy—flood plains

Slope: Fairway—0 to 4 percent; Bigsandy—0 to 2 percent

Composition**Major Components**

Fairway and similar soils: 45 percent

Bigsandy and similar soils: 40 percent

Minor Components

Kiwanis and similar soils: 0 to 5 percent

Nesda and similar soils: 0 to 5 percent

Soils that are frequently flooded: 0 to 5 percent

Major Component Description**Fairway**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: 8.1 inches

Bigsandy

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Available water capacity: 8.0 inches

Farnuf Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landforms: Alluvial fans, stream terraces, or small drainageways

Parent material: Alluvium

Slope range: 0 to 8 percent

Annual precipitation: 13 to 17 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed Typic
Argiborolls

Typical Pedon

Farnuf clay loam, 0 to 3 percent slopes, in a cropland area, 500 feet north and 400 feet west of the southeast corner of sec. 8, T. 36 N. R. 4 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; neutral; abrupt smooth boundary.

Bt—7 to 15 inches; dark brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; many very fine and fine roots and pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Bk1—15 to 24 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak medium prismatic structure; hard, friable, sticky and plastic; many fine roots and pores; few fine threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—24 to 36 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure; hard, friable, sticky and plastic; common fine roots and many fine pores; common medium soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C—36 to 60 inches; light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 7 to 15 inches

Mollic epipedon thickness: 7 to 15 inches

Content of clay in the control section: 25 to 35 percent

Depth to Bk horizon: 10 to 25 inches

Note: Some pedons have a Bk or 2BCKy horizon below depths of 35 inches.

Ap horizon

Hue: 2.5Y or 10YR

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 32 percent

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 3, 4, 5, or 6 dry; 2, 3, or 4 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.8

Note: Some pedons have a thin Btk horizon.

Bk horizons

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Fine sandy loam, loam, silt loam, silty clay loam, or clay loam

Clay content: 20 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

C horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam—the strata consist of thin layers of fine sandy loam, clay loam, silty clay loam, silty clay, or silt loam

Rock fragments: 0 to 30 percent—0 to 10 percent cobbles, 0 to 20 percent pebbles

Reaction: pH 7.4 to 8.4

75B—Farnuf clay loam, 0 to 3 percent slopes

Setting

Landforms: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 3 percent

Composition

Major Components

Farnuf and similar soils: 85 percent

Minor Components

Daglum and similar soils: 0 to 10 percent

Farnuf clay loam, calcareous: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.7 inches

75C—Farnuf clay loam, 3 to 8 percent slopes**Setting**

Landforms: Alluvial fans, stream terraces, and drainageways
 Slope: 3 to 8 percent

Composition**Major Components**

Farnuf and similar soils: 85 percent

Minor Components

Daglum and similar soils: 0 to 10 percent
 Farnuf clay loam, calcareous: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.7 inches

Ferd Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landforms: Alluvial fans, stream terraces, or till plains
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Glossic Eutroboralfs

Typical Pedon

Ferd loam, 0 to 4 percent slopes, in a cropland area, 2,500 feet north and 2,200 feet west of the southeast corner of sec. 11, T. 32 N., R. 2 W.

Ap—0 to 5 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 4/3) moist; hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; neutral; abrupt smooth boundary.

E/Bt—5 to 9 inches; about 60 percent light brownish gray (2.5Y 6/2) loam, dark brown (10YR 4/3) moist (E part); about 40 percent brown (10YR 5/3) loam, brown (10YR 4/3) moist (Bt part); moderate medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; few faint clay films on faces of peds; neutral; abrupt wavy boundary.

Bt1—9 to 12 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bt2—12 to 16 inches; pale brown (10YR 6/3) clay loam, olive brown (2.5Y 4/3) moist; strong medium prismatic structure parting to strong medium angular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and many very fine and coarse pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bk1—16 to 30 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and many very fine pores; common fine soft masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

Bk2—30 to 41 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, friable, slightly sticky and plastic; few very fine and fine roots and pores; common fine soft masses of lime; violently effervescent; strongly alkaline; clear smooth boundary.

BC—41 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; strongly effervescent; strongly alkaline.

Range in Characteristics

Control section: 9 to 16 inches

Content of clay in the control section: 35 to 50 percent

Depth to Bk horizon: 12 to 16 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 3 or 4 moist

Clay content: 20 to 27 percent

Reaction: pH 6.6 to 7.8

E/Bt horizon

Hue: 10YR or 2.5Y

Texture: loam, clay loam, or silty clay loam

Clay content: 22 to 35 percent

Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

Chroma: 2 or 3

Texture: clay loam, silty clay loam, or clay

Clay content: 35 to 50 percent

Electrical conductivity: less than 2 mmhos/cm

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam or silty clay loam

Clay content: 27 to 40 percent

Calcium carbonate equivalent: 5 to 15 percent

Sodium absorption ratio: 0 to 13

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay loam or silty clay loam

Clay content: 27 to 40 percent

Calcium carbonate equivalent: 5 to 15 percent

Sodium absorption ratio: 8 to 13

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.6

Note: Some pedons have a Bk₃, By, or Bk_y horizon and thin lenses of fine sandy loam or fine sand below 30 inches.

39B—Ferd loam, 0 to 4 percent slopes**Setting**

Landforms: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Composition**Major Components**

Ferd and similar soils: 85 percent

Minor Components

Gerdrum and similar soils: 0 to 5 percent

Absher and similar soils: 0 to 5 percent

Soils that have slopes more than 4 percent:
0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

391B—Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes**Setting**

Landforms: Ferd—alluvial fans and stream terraces;

Creed—alluvial fans and stream terraces;

Gerdrum—alluvial fans and stream terraces

Position on landform: Ferd—microhighs; Creed—microhighs; Gerdrum—microlows

Slope: Ferd—0 to 4 percent; Creed—0 to 4 percent;

Gerdrum—0 to 4 percent

Composition**Major Components**

Ferd and similar soils: 40 percent

Creed and similar soils: 35 percent

Gerdrum and similar soils: 20 percent

Minor Components

Gerdrum fine sandy loam: 0 to 2 percent

Absher and similar soils: 0 to 2 percent

Slickspots: 0 to 1 percent

Major Component Description

Ferd

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Creed

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 6.4 inches

Gerdrum

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.8 inches

391C—Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes

Setting

Landforms: Ferd—alluvial fans and stream terraces;
 Creed—alluvial fans and stream terraces;
 Gerdrum—alluvial fans and stream terraces
 Position on landform: Ferd—microhighs; Creed—
 microhighs; Gerdrum—microlows
 Slope: Ferd—4 to 8 percent; Creed—4 to 8 percent;
 Gerdrum—4 to 8 percent

Composition

Major Components

Ferd and similar soils: 35 percent
 Creed and similar soils: 30 percent
 Gerdrum and similar soils: 20 percent

Minor Components

Soils that have fine sandy loam surface layers:
 0 to 5 percent
 Absher and similar soils: 0 to 4 percent
 Slickspots: 0 to 3 percent
 Soils that have slopes more than 8 percent:
 0 to 3 percent

Major Component Description

Ferd

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Creed

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 6.4 inches

Gerdrum

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.8 inches

Fleak Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Hills
Parent material: Residuum weathered from soft
 sandstone
Slope range: 8 to 25 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Mixed, frigid, shallow Aridic
Ustipsamments

Typical Pedon

Fleak fine sandy loam in an area of Fleak-Lihen fine sandy loams, 8 to 25 percent slopes; in a rangeland area, 2,410 feet north and 2,200 feet west of the southeast corner of sec. 18, T. 36 N., R. 1 E.

- A—0 to 4 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; strongly effervescent; mildly alkaline; abrupt wavy boundary.
- C1—4 to 8 inches; light brownish gray (2.5Y 6/2) loamy fine sand, light olive brown (2.5Y 5/4) moist; single grain; loose, nonsticky and nonplastic; many very fine roots and many very fine and fine pores; violently effervescent; mildly alkaline; clear smooth boundary.
- C2—8 to 18 inches; light brownish gray (2.5Y 6/2) fine sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots and pores; violently effervescent; moderately alkaline; clear smooth boundary.
- Cr—18 to 60 inches; light gray (10YR 7/2) semiconsolidated sandstone, grayish brown (10YR 5/2) moist; violently effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 18 inches

Content of clay in the control section: 0 to 15 percent

Depth to semiconsolidated bedrock: 10 to 20 inches

A horizon

Hue: 10YR, 7.5YR, or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Reaction: pH 6.6 to 7.8

C horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Above the sandstone is fine sand or loamy fine sand

Clay content: 0 to 15 percent

Reaction: pH 6.6 to 8.4

Cr horizon

Reaction: pH 6.6 to 8.4

651E—Fleak-Lihen fine sandy loams, 8 to 25 percent slopes

Setting

Landforms: Fleak—hills; Lihen—hills

Position on landform: Fleak—shoulders; Lihen—back slopes

Slope: Fleak—8 to 25 percent; Lihen—8 to 25 percent

Composition

Major Components

Fleak and similar soils: 50 percent

Lihen and similar soils: 35 percent

Minor Components

Soils that have slopes less than 8 percent: 0 to 10 percent

Yamac and similar soils: 0 to 5 percent

Major Component Description

Fleak

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Excessively drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 1.4 inches

Lihen

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.5 inches

Floweree Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderately slow (0.2 to 0.6 inch/hour)

Landform: Alluvial fans

Parent material: Alluvium or eolian deposits

Slope range: 2 to 8 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-silty, mixed Aridic
Haploborolls

Typical Pedon

Floweree silt loam, 2 to 8 percent slopes, in a rangeland area, 2,600 feet north and 50 feet east of the southwest corner of sec. 18, T. 30 N., R. 1 W.

A—0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and plastic; few very fine roots and pores; mildly alkaline; clear smooth boundary.

Bw—5 to 11 inches; grayish brown (10YR 5/2) silty loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots and few very fine pores; mildly alkaline; clear smooth boundary.

Bk1—11 to 17 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure; slightly hard, friable, sticky and plastic; few fine and coarse roots and few fine pores; few fine threads of lime; strongly effervescent; mildly alkaline; clear smooth boundary.

Bk2—17 to 25 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 5/3) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and plastic; few fine roots and pores; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—25 to 60 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; violently effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 7 to 15 inches

Content of clay in the control section: 20 to 35 percent

Depth to Bk horizon: 11 to 25 inches

A horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 20 to 35

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5, 6, 7, or 8 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR or 2.5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or loam consisting of thin strata of silt loam, very fine sandy loam and/or clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium absorption ratio: 0 to 15

Reaction: pH 7.9 to 9.0

Note: Some pedons have a Bky horizon.

49C—Floweree silt loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 2 to 8 percent

Composition

Major Components

Floweree and similar soils: 85 percent

Minor Components

Lonna and similar soils: 0 to 10 percent

Brockway and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium or eolian material
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.4 inches

Gerber Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landforms: Alluvial fans or stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine, montmorillonitic Vertic Argiborolls

Typical Pedon

Gerber clay, 0 to 4 percent slopes, in a cropland area, 50 feet north and 2,600 feet west of the southeast corner of sec. 32, T. 37 N., R. 4 W.

- Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, firm, sticky and plastic; many very fine and common fine roots and common very fine and fine discontinuous vesicular pores; mildly alkaline; abrupt smooth boundary.
- Bt—6 to 15 inches; brown (10YR 5/3) silty clay, dark brown (2.5Y 4/3) moist; strong medium blocky structure; very hard, very firm, sticky and plastic; few very fine and common fine roots and common fine discontinuous pores; common faint clay films on faces of peds; common pressure faces; mildly alkaline; clear wavy boundary.
- Bk—15 to 20 inches; light brownish gray (2.5Y 6/2) silty clay, olive gray (5Y 5/2) moist; strong medium blocky structure; extremely hard, firm, sticky and plastic; few very fine roots and discontinuous tubular pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.
- C—20 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; few very

fine roots and discontinuous tubular pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 35 to 60 percent
Depth to Bk horizon: 12 to 20 inches
Note: Some pedons have B_y or 2C horizons.

Ap horizon

Value: 4 or 5 dry; 3 moist
 Chroma: 2 or 3
 Clay content: 40 to 50 percent
 Reaction: pH 6.6 to 7.8

Bt horizon

Value: 4 or 5 dry; 3 or 4 moist
 Chroma: 2 or 3
 Texture: Silty clay or clay
 Clay content: 45 to 60 percent
 Reaction: pH 7.4 to 8.4
Note: A B_{tk} horizon is allowed.

Bk horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: Silty clay, silty clay loam, clay loam, or clay
 Clay content: 35 to 50 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: Clay loam, silty clay loam, silty clay, or clay
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 3 to 15 percent
 Reaction: pH 7.4 to 9.0

68B—Gerber clay, 0 to 4 percent slopes

Setting

Landforms: Alluvial fans and stream terraces
 Slope: 0 to 4 percent

Composition

Major Components

Gerber and similar soils: 85 percent

Minor Components

Gerber clay calcareous: 0 to 7 percent
Soils that are ponded: 0 to 2 percent
Daglum and similar soils: 0 to 6 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.6 inches

Gerdrum Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch/hour)
Landforms: Alluvial fans or stream terraces
Parent material: Alluvium
Slope range: 0 to 8 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic
Natriboralfs

Typical Pedon

Gerdrum clay loam in an area of Gerdrum-Absher complex, 0 to 2 percent slopes; in a rangeland area, 1,500 feet north and 2,300 feet east of the southwest corner of sec. 31, T. 33 N., R. 1 W.

- E—0 to 4 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; strong thin platy structure; hard, friable, sticky and plastic; many very fine and fine roots and common very fine and fine pores; mildly alkaline; abrupt smooth boundary.
- Btn1—4 to 7 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong coarse columnar structure; hard, friable, sticky and plastic; many very fine and fine roots and common very fine and fine pores; many distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.
- Btn2—7 to 14 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong coarse prismatic structure; hard, friable, sticky and plastic; many very fine and fine roots and common very fine and fine pores; many distinct clay films on faces of peds; strongly alkaline; clear smooth boundary.

- Bkn—14 to 29 inches; light brownish gray (10YR 6/2) clay loam, dark brownish gray (10YR 4/2) moist; weak coarse prismatic structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and pores; common soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.
- Bnyz1—29 to 45 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; massive; very hard, firm, sticky and plastic; common very fine and fine roots and few very fine and fine pores; common soft masses and seams of gypsum and other salts; strongly alkaline; gradual smooth boundary.
- Bnyz2—45 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; common soft masses and seams of gypsum and other salts; strongly alkaline.

Range in Characteristics

Control section: 4 to 14 inches
Content of clay in the control section: 35 to 55 percent
Depth to the Bkn horizon: 10 to 24 inches
Depth to the Bnyz horizon: 10 to 29 inches

E horizon

Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3
Clay content: 27 to 40 percent
Reaction: pH 6.6 to 7.8

Btn1 horizon

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2, 3, or 4
Texture: Clay, silty clay, or silty clay loam
Clay content: 35 to 55 percent
Rock fragments: 0 to 10 percent pebbles
Structure: Fine to coarse columnar or medium or coarse blocky
Hardness: Extremely or very hard when dry
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 10 to 20; pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2
Reaction: pH 7.4 to 9.0

Btn2 horizon

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2, 3, or 4
Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 55 percent
 Rock fragments: 0 to 10 percent pebbles
 Structure: Fine to coarse prismatic or medium or coarse blocky
 Hardness: Extremely or very hard when dry
 Electrical conductivity: 2 to 8 mmhos/cm
 Sodium absorption ratio: 10 to 20; pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2
 Reaction: pH 7.4 to 9.0

Bkn and Bnyz horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Clay loam, sandy clay loam, clay, or silty clay
 Clay content: 30 to 50 percent
 Rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium absorption ratio: 13 to 30
 Gypsum: 1 to 5 percent
 Reaction: pH 7.9 to 9.0

402A—Gerdrum-Absher complex, 0 to 2 percent slopes***Setting***

Landforms: Gerdrum—alluvial fans and stream terraces; Absher—alluvial fans and stream terraces
 Position on landform: Gerdrum—microhighs; Absher—microlows
 Slope: Gerdrum—0 to 2 percent; Absher—0 to 2 percent

Composition**Major Components**

Gerdrum and similar soils: 55 percent
 Absher and similar soils: 30 percent

Minor Components

Ferd and similar soils: 0 to 5 percent
 Nobe and similar soils: 0 to 5 percent
 Slickspots: 0 to 5 percent

Major Component Description**Gerdrum**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.8 inches

Absher

Surface layer texture: Clay
 Depth class: Very deep (more than 60 inches)
 Drainage class: Moderately well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 4.1 inches

Glendive Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Glendive fine sandy loam in an area of Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded; in a rangeland area, 1,800 feet south and 3,000 feet east of the northwest corner of sec. 9, T. 31 N., R. 4 W.

A—0 to 2 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable, nonsticky and nonplastic; common very fine and fine roots and many very fine and fine discontinuous vesicular pores; violently effervescent; neutral; clear smooth boundary.
 C1—2 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, friable, nonsticky and nonplastic; many very fine and fine roots and common very fine discontinuous

vesicular pores; violently effervescent; mildly alkaline; gradual smooth boundary.

C2—8 to 60 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots and pores; violently effervescent; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 5 to 18 percent

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent clay

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.6 to 9.0

Note: This horizon with values of 4 or 5 dry, 3 or 4 moist and chroma of 2 or 3 may meet the requirements for mollic except for thickness.

C1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, sandy loam, or fine sandy loam

Clay content: 5 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

C2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Sandy loam or fine sandy loam consisting of strata of loam, sandy loam, silt loam, loamy sand, loamy fine sand, and occasionally clay loam

Clay content: 5 to 18 percent

Rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.4 to 9.0

Note: Some pedons have 15 to 60 percent coarse fragments below a depth of 40 inches.

Hanly Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat excessively drained

Permeability: Rapid (6.0 to 20.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Sandy, mixed, frigid Aridic Ustifluvents

Typical Pedon

Hanly loamy sand in an area of Hanly-Glendive-Havre complex, 0 to 2 percent slopes; in a rangeland area, 1,300 feet north and 600 feet west of the southeast corner of sec. 35, T. 35 N., R. 2 E.

A—0 to 4 inches; light brownish gray (10YR 6/2) loamy sand, dark brownish gray (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine roots; strongly effervescent; neutral; clear smooth boundary.

C1—4 to 14 inches; light gray (10YR 7/2) stratified sand and loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; strongly effervescent; neutral; clear smooth boundary.

C2—14 to 31 inches; light brownish gray (10YR 6/2) stratified sand and loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; strongly effervescent; mildly alkaline; clear smooth boundary.

C3—31 to 60 inches; light brownish gray (10YR 6/2) stratified sand and loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 0 to 10 percent

A horizon

Hue: 2.5Y or 10YR

Value: 5, 6, or 7 dry; 4, 5, or 6 moist (surface horizons having value as dark as 5 dry and 3 moist do not exceed 6 inches in thickness)

Chroma: 2 or 3

Clay content: 5 to 10 percent

Reaction: pH 6.6 to 8.4

C horizons

Hue: 10YR, 2.5Y, or 5YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Clay content: 5 to 10 percent
 Reaction: pH 6.6 to 8.4

Note: Some pedons contain thin coarse sand layers below a depth of 31 inches; a few pedons contain thin Ab horizons below a depth of 40 inches.

101A—Hanly-Glendive-Havre complex, 0 to 2 percent slopes

Setting

Landforms: Hanly—flood plains; Glendive—flood plains; Havre—flood plains
 Slope: Hanly—0 to 2 percent; Glendive—0 to 2 percent; Havre—0 to 2 percent

Composition

Major Components

Hanly and similar soils: 50 percent
 Glendive and similar soils: 20 percent
 Havre and similar soils: 15 percent

Minor Components

Korchea and similar soils: 0 to 3 percent
 Bigsag and similar soils: 0 to 3 percent
 Bigsandy and similar soils: 0 to 3 percent
 Harlem and similar soils: 0 to 3 percent
 Soils with areas of cottonwood trees: 0 to 3 percent

Major Component Description

Hanly

Surface layer texture: Loamy sand
 Depth class: Very deep (more than 60 inches)
 Drainage class: Excessively drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Rare
 Available water capacity: 5.7 inches

Glendive

Surface layer texture: Fine sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland

Flooding: Rare
 Available water capacity: 7.4 inches

Havre

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Rare
 Available water capacity: 9.7 inches

Harlake Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Harlake silty clay loam, 0 to 2 percent slopes, in a rangeland area, 1,800 feet north and 300 feet west of the southeast corner of sec. 12, T. 31 N., R. 4 W.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate thin and medium platy structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and many very fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—4 to 16 inches; dark grayish brown (2.5Y 4/2) silty clay loam, very dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure; hard, firm, very sticky and very plastic; common very fine roots and many very fine pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—16 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots and common very fine pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

C3—30 to 60 inches; dark grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; few fine roots and common fine pores; slightly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 35 to 60 percent

A horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.6 to 8.4

Note: Some pedons have a thin dark colored surface about 4 inches thick that has values of 4 or 5 dry, 3 moist, and chroma of 2 or 3.

C1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay

Clay content: 35 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

C2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay

Clay content: 35 to 60 percent

Electrical conductivity: 0 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

C3 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam, loam, clay loam, or fine sandy loam consisting of stratified layers of silty clay loam, silt loam, and fine sandy loam

Clay content: 15 to 35 percent

Electrical conductivity: 0 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

90A—Harlake silty clay loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Composition

Major Components

Harlake and similar soils: 85 percent

Minor Components

Havre and similar soils: 0 to 5 percent

Soils that are occasionally flooded: 0 to 4 percent

Bigsag and similar soils: 0 to 3 percent

Bigsandy and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: 8.3 inches

Havre Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Havre loam in an area of Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded; in a cropland area, 300 feet south and 100 feet east of the northwest corner of sec. 36, T. 31 N., R. 2 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; few very fine roots and discontinuous pores; strongly effervescent; mildly alkaline; clear wavy boundary.

C1—6 to 24 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots and discontinuous pores; strongly effervescent; mildly alkaline; gradual wavy boundary.

C2—24 to 37 inches; light yellowish brown (10YR 6/3) silt loam, dark yellowish brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few very fine roots and discontinuous pores; strongly effervescent; mildly alkaline; gradual wavy boundary.

C3—37 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; massive; hard, firm, slightly sticky and plastic; strongly effervescent; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 18 to 35 percent

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, clay loam, or silty clay loam

Clay content: 15 to 40 percent

Reaction: pH 6.1 to 9.0

Note: Some pedons have a thin A horizon that has a value of 4 dry and 3 moist and does not meet the requirement for a mollic epipedon after mixing to 7 inches.

C horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, silt loam, or clay loam which consist of strata of silt loam, fine sandy loam, silty clay loam, and clay loam

Clay content: 18 to 35 percent

Reaction: pH 7.4 to 9.0

Note: Some pedons have 15 to 60 percent coarse fragments below a depth of 40 inches.

60A—Havre silty clay loam, 0 to 2 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Composition

Major Components

Havre and similar soils: 85 percent

Minor Components

Hanly and similar soils: 0 to 5 percent

Bigzag and similar soils: 0 to 3 percent

Bigsandy and similar soils: 0 to 2 percent

Rivra and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: 9.6 inches

603A—Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landforms: Havre—flood plains; Glendive—flood plains

Slope: Havre—0 to 2 percent; Glendive—0 to 2 percent

Composition

Major Components

Havre and similar soils: 45 percent

Glendive and similar soils: 40 percent

Minor Components

Soils that are rarely flooded: 0 to 3 percent

Harlem and similar soils: 0 to 3 percent

Soils that are frequently flooded: 0 to 3 percent

Bigzag and similar soils: 0 to 2 percent

Bigsandy and similar soils: 0 to 2 percent

Soils with areas of cottonwood trees: 0 to 2 percent

Major Component Description

Havre

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Occasional
 Available water capacity: 9.7 inches

Glendive

Surface layer texture: Fine sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Occasional
 Available water capacity: 7.5 inches

601A—Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded

Setting

Landforms: Havre—flood plains; Glendive—flood plains
 Slope: Havre—0 to 2 percent; Glendive—0 to 2 percent

Composition

Major Components

Havre and similar soils: 50 percent
 Glendive and similar soils: 35 percent

Minor Components

Harlem and similar soils: 0 to 5 percent
 Soils that are occasionally flooded: 0 to 4 percent
 Bigsag and similar soils: 0 to 3 percent
 Bigsandy and similar soils: 0 to 3 percent

Major Component Description

Havre

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Rare
 Available water capacity: 9.7 inches

Glendive

Surface layer texture: Fine sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Rare
 Available water capacity: 7.4 inches

Hedstrom Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour) to 31 inches; rapid below this depth (6.0 to 20.0 inches/hour)
Landforms: Alluvial fans or relict stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls

Typical Pedon

Hedstrom fine sandy loam, 0 to 4 percent slopes, in a cropland area, 2,400 feet north and 2,750 feet west of the southeast corner of sec. 12, T. 35 N., R. 3 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and discontinuous pores; neutral; gradual wavy boundary.

Bt1—5 to 12 inches; dark brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and discontinuous pores; common distinct clay films on faces of peds; neutral; gradual wavy boundary.

Bt2—12 to 21 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and discontinuous pores; common distinct clay films on faces of peds; neutral; abrupt wavy boundary.

Bk—21 to 31 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and discontinuous pores; many medium soft masses and seams of lime; violently effervescent; moderately alkaline; abrupt wavy boundary.

2C—31 to 60 inches; light brownish gray (2.5Y 6/2) sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; mildly alkaline.

Range in Characteristics

Control section: 5 to 40 inches

Mollic epipedon thickness: 10 to 16 inches

Depth to Bk horizon: 15 to 30 inches

Depth to 2C horizon: 20 to 40 inches

Ap horizon

Value: 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 20 percent

Reaction: pH 6.6 to 7.3

Bt horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: Sandy clay loam or clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Sandy clay loam or loam

Clay content: 20 to 30 percent

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.9 to 9.0

2C horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Sand, fine sand, or loamy fine sand

Clay content: 0 to 5 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

59B—Hedstrom fine sandy loam, 0 to 4 percent slopes

Setting

Landforms: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Composition

Major Components

Hedstrom and similar soils: 85 percent

Minor Components

Dast and similar soils: 0 to 8 percent

Gerber and similar soils: 0 to 7 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.8 inches

Hillon Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landforms: Hills, escarpments, or till plains

Parent material: Glacial till

Slope range: 0 to 70 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents

Typical Pedon

Hillon clay loam in an area of Joplin-Hillon clay loams, 0 to 3 percent slopes; in a rangeland area, 250 feet north and 2,300 feet east of the southwest corner of sec. 17, T. 36 N., R. 1 E.

A—0 to 5 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; strong very fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots and common very fine and fine discontinuous pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—5 to 12 inches; light brownish gray (10YR 6/2) clay loam, dark brownish gray (10YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; many very fine and fine roots and discontinuous pores; common fine and medium soft masses of lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bk2—12 to 30 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and discontinuous pores; many fine and medium soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bky—30 to 40 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common fine roots and discontinuous pores; few fine soft masses of lime; common medium soft masses of gypsum; slightly effervescent; mildly alkaline; clear wavy boundary.

C—40 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots and discontinuous pores; slightly effervescent; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 20 to 35 percent

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 25 percent—0 to 10 percent cobbles and stones, 0 to 15 percent pebbles

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent with 25 to 35 percent fine sand and coarser sand

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Bulk density: 1.55 to 1.75 g/ccm

Reaction: pH 7.9 to 9.0

Bky and C horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent with 25 to 35 percent fine sand and coarser sand

Rock fragments: 0 to 15 percent pebbles

Bulk density: 1.55 to 1.75 g/ccm

Calcium carbonate equivalent: 2 to 12 percent

Reaction: pH 7.9 to 9.0

22E—Hillon clay loam, 8 to 25 percent slopes

Setting

Landform: Hills

Slope: 8 to 25 percent

Composition

Major Components

Hillon and similar soils: 85 percent

Minor Components

Slopes more than 25 percent: 0 to 5 percent

Kevin and similar soils: 0 to 4 percent

Neldore and similar soils: 0 to 2 percent

Bascovy and similar soils: 0 to 2 percent

Cabbart and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.9 inches

22F—Hillon clay loam, 25 to 60 percent slopes

Setting

Landform: Hills

Slope: 25 to 60 percent

Composition**Major Components**

Hillon and similar soils: 90 percent

Minor Components

Rock outcrop: 0 to 2 percent
 Neldore and similar soils: 0 to 2 percent
 Bascovy and similar soils: 0 to 2 percent
 Cabbart and similar soils: 0 to 2 percent
 Noncalcareous surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.9 inches

423C—Hillon-Joplin clay loams, 3 to 8 percent slopes**Setting**

Landforms: Hillon—till plains; Joplin, calcareous—till plains
 Position on landform: Hillon—back slopes; Joplin, calcareous—foot slopes
 Slope: Hillon—3 to 8 percent; Joplin, calcareous—3 to 8 percent

Composition**Major Components**

Hillon and similar soils: 50 percent
 Joplin, calcareous and similar soils: 35 percent

Minor Components

Noncalcareous surface layers: 0 to 10 percent
 McKenzie and similar soils: 0 to 2 percent
 Elloam and similar soils: 0 to 2 percent
 Marvan and similar soils: 0 to 1 percent

Major Component Description**Hillon**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till

Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.9 inches

Joplin, calcareous

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

224E—Hillon-Joplin loams, 8 to 25 percent slopes**Setting**

Landforms: Hillon—hills; Joplin—hills
 Position on landform: Hillon—shoulders; Joplin—back slopes
 Slope: Hillon—15 to 25 percent; Joplin—8 to 15 percent

Composition**Major Components**

Hillon and similar soils: 50 percent
 Joplin and similar soils: 35 percent

Minor Components

Elloam and similar soils: 0 to 5 percent
 Hillon gravelly loam: 0 to 5 percent
 Joplin gravelly loam: 0 to 5 percent

Major Component Description**Hillon**

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.0 inches

Joplin

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland

Flooding: None
Available water capacity: 9.2 inches

221E—Hillon-Kevin clay loams, 15 to 25 percent slopes

Setting

Landforms: Hillon—hills; Kevin—hills
Position on landform: Hillon—shoulders; Kevin—back slopes
Slope: Hillon—15 to 25 percent; Kevin—15 to 25 percent

Composition

Major Components

Hillon and similar soils: 55 percent
Kevin and similar soils: 30 percent

Minor Components

Delpoint and similar soils: 0 to 8 percent
Soils that have slopes more than 25 percent: 0 to 7 percent

Major Component Description

Hillon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

222E—Hillon-Neldore complex, 8 to 25 percent slopes

Setting

Landforms: Hillon—hills; Neldore—hills
Position on landform: Hillon—shoulders; Neldore—back slopes

Slope: Hillon—8 to 15 percent; Neldore—15 to 25 percent

Composition

Major Components

Hillon and similar soils: 50 percent
Neldore and similar soils: 35 percent

Minor Components

Soils that have slopes more than 25 percent: 0 to 10 percent
Rock outcrop: 0 to 5 percent

Major Component Description

Hillon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

Neldore

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 2.6 inches

222F—Hillon-Neldore complex, 25 to 70 percent slopes

Setting

Landforms: Hillon—hills; Neldore—hills
Position on landform: Hillon—shoulders; Neldore—back slopes
Slope: Hillon—45 to 70 percent; Neldore—25 to 45 percent

Composition

Major Components

Hillon and similar soils: 45 percent
Neldore and similar soils: 40 percent

Minor Components

Soils that have slopes less than 25 percent: 0 to 10 percent
Rock outcrop: 0 to 5 percent

Major Component Description

Hillon

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.9 inches

Neldore

Surface layer texture: Clay
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.6 inches

Joplin Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landforms: Till plains or hills
Parent material: Glacial till
Slope range: 0 to 15 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic
 Argiborolls

Typical Pedon

Joplin clay loam, 0 to 4 percent slopes, in a cropland area, 1,600 feet north and 1,600 feet east of the southwest corner of sec. 3, T. 32 N., R. 3 W.

Ap—0 to 4 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; few very fine roots and common very fine discontinuous pores; neutral; clear smooth boundary.

Bt—4 to 9 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure; slightly hard, firm, sticky and plastic; few very fine roots and common very fine discontinuous pores; common distinct clay films on faces of peds; neutral; gradual wavy boundary.

Bk1—9 to 16 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium

subangular blocky structure; hard, firm, sticky and plastic; few very fine roots and common very fine discontinuous pores; common soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—16 to 26 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak moderate subangular blocky structure; slightly hard, firm, sticky and plastic; few very fine roots and common very fine discontinuous pores; many soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—26 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few very fine roots and common very fine discontinuous pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 4 to 40 inches

Mollic epipedon thickness: 7 to 9 inches

Content of clay in the control section: 18 to 32 percent

Depth to Bk horizon: Less than 10 inches

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Texture: Clay loam or loam

Clay content: 10 to 32 percent

Rock fragments: 0 to 35 percent—0 to 10 percent cobbles, 0 to 25 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 8.4

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 32 percent

Rock fragments: 0 to 35 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3
 Texture: Loam or clay loam
 Clay content: 18 to 32 percent
 Rock fragments: 0 to 35 percent pebbles
 Moist bulk density: 1.6 to 1.8 gr/cm
 Reaction: pH 7.4 to 8.4
Note: Some pedons have some gypsum and salts in the lower part of the C horizon.

42B—Joplin clay loam, 0 to 4 percent slopes

Setting

Landform: Till plains
 Slope: 0 to 4 percent

Composition

Major Components

Joplin and similar soils: 85 percent

Minor Components

Joplin clay loam calcareous: 0 to 5 percent
 Elloam and similar soils: 0 to 5 percent
 Soils that have slopes more than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

42C—Joplin clay loam, 4 to 8 percent slopes

Setting

Landform: Till plains
 Slope: 4 to 8 percent

Composition

Major Components

Joplin and similar soils: 85 percent

Minor Components

Joplin clay loam, calcareous: 0 to 5 percent
 Elloam and similar soils: 0 to 5 percent

Soils that have slopes more than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

427B—Joplin complex, 0 to 4 percent slopes

Setting

Landforms: Joplin—till plains; Joplin, calcareous—till plains
 Slope: Joplin—0 to 4 percent; Joplin, calcareous—0 to 4 percent

Composition

Major Components

Joplin and similar soils: 45 percent
 Joplin, calcareous and similar soils: 40 percent

Minor Components

Elloam and similar soils: 0 to 7 percent
 McKenzie and similar soils: 0 to 2 percent
 Soils that have slopes more than 4 percent: 0 to 6 percent

Major Component Description

Joplin

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

Joplin, calcareous

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

427C—Joplin complex, 4 to 8 percent slopes***Setting***

Landforms: Joplin—till plains; Joplin, calcareous—till plains
 Position on landform: Joplin—foot slopes; Joplin, calcareous—back slopes
 Slope: Joplin—4 to 8 percent; Joplin, calcareous—4 to 8 percent

Composition**Major Components**

Joplin and similar soils: 50 percent
 Joplin, calcareous and similar soils: 35 percent

Minor Components

Elloam and similar soils: 0 to 13 percent
 McKenzie and similar soils: 0 to 2 percent

Major Component Description**Joplin**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

Joplin, calcareous

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

426B—Joplin loam, 0 to 4 percent slopes***Setting***

Landform: Till plains
 Slope: 0 to 4 percent

Composition**Major Components**

Joplin and similar soils: 85 percent

Minor Components

Elloam and similar soils: 0 to 7 percent
 McKenzie and similar soils: 0 to 2 percent
 Joplin loam calcareous: 0 to 6 percent

Major Component Description

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.2 inches

423B—Joplin-Hillon clay loams, 0 to 3 percent slopes***Setting***

Landforms: Joplin, calcareous—till plains; Hillon—till plains
 Slope: Joplin, calcareous—0 to 3 percent; Hillon—0 to 3 percent

Composition**Major Components**

Joplin, calcareous and similar soils: 50 percent
 Hillon and similar soils: 35 percent

Minor Components

Soils that have noncalcareous surface layers: 0 to 7 percent
 McKenzie and similar soils: 0 to 2 percent
 Elloam and similar soils: 0 to 6 percent

Major Component Description**Joplin, calcareous**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

Hillon

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland

Flooding: None
Available water capacity: 9.9 inches

421C—Joplin-Hillon clay loams, 2 to 8 percent slopes

Setting

Landforms: Joplin—till plains; Hillon—till plains
Position on landform: Joplin—back slopes; Hillon—shoulders
Slope: Joplin—2 to 8 percent; Hillon—2 to 8 percent

Composition

Major Components

Joplin and similar soils: 55 percent
Hillon and similar soils: 40 percent

Minor Components

Elloam and similar soils: 0 to 2 percent
McKenzie and similar soils: 0 to 2 percent
Slopes more than 8 percent: 0 to 1 percent

Major Component Description

Joplin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.1 inches

Hillon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

421D—Joplin-Hillon clay loams, 8 to 15 percent slopes

Setting

Landforms: Joplin—hills; Hillon—hills
Position on landform: Joplin—back slopes; Hillon—shoulders
Slope: Joplin—8 to 15 percent; Hillon—8 to 15 percent

Composition

Major Components

Joplin and similar soils: 45 percent
Hillon and similar soils: 40 percent

Minor Components

Elloam and similar soils: 0 to 13 percent
McKenzie and similar soils: 0 to 2 percent

Major Component Description

Joplin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.1 inches

Hillon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

424C—Joplin-Hillon gravelly loams, 3 to 8 percent slopes

Setting

Landforms: Joplin—till plains; Hillon—till plains
Position on landform: Joplin—foot slopes; Hillon—back slopes
Slope: Joplin—3 to 8 percent; Hillon—3 to 8 percent

Composition

Major Components

Joplin and similar soils: 50 percent
Hillon and similar soils: 35 percent

Minor Components

Elloam and similar soils: 0 to 7 percent
McKenzie and similar soils: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 6 percent

Major Component Description

Joplin

Surface layer texture: Gravelly loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

Hillon

Surface layer texture: Gravelly loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.8 inches

425C—Joplin-Telstad clay loams, 2 to 8 percent slopes

Setting

Landforms: Joplin, calcareous—till plains;
 Telstad—till plains
 Position on landform: Joplin, calcareous—back slopes; Telstad—foot slopes
 Slope: Joplin, calcareous—2 to 8 percent; Telstad—2 to 8 percent

Composition

Major Components

Joplin, calcareous and similar soils: 50 percent
 Telstad and similar soils: 35 percent

Minor Components

Soils that have noncalcareous surface layers: 0 to 7 percent
 McKenzie and similar soils: 0 to 2 percent
 Elloam and similar soils: 0 to 6 percent

Major Component Description

Joplin, calcareous

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.1 inches

Telstad

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.8 inches

Kenilworth Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Alluvium or eolian deposits over glacial till
Slope range: 0 to 4 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Kenilworth fine sandy loam, 0 to 4 percent slopes, in a cropland area, 2,100 feet east and 1,200 feet south of the northwest corner of sec. 21, T. 32 N., R. 1 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots and discontinuous pores; mildly alkaline; clear smooth boundary.

Bt—6 to 11 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure; hard, firm, sticky and plastic; few very fine roots and discontinuous pores; few faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk1—11 to 15 inches; light brownish gray (10YR 6/2) fine sandy loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and discontinuous pores; few medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

2Bk2—15 to 24 inches; light gray (10YR 7/2) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and

discontinuous pores; common medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C1—24 to 37 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse angular blocky structure; hard, firm, very sticky and plastic; moderately alkaline; gradual wavy boundary.

2C2—37 to 60 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak coarse angular blocky structure; very hard, very firm, very sticky and plastic; moderately alkaline.

Range in Characteristics

Control section: 6 to 11 inches

Mollic epipedon thickness: 7 to 15 inches

Content of clay in the control section: 18 to 30 percent

Depth to Bk horizon: 12 to 24 inches

Ap horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Fine sandy loam or loam

Clay content: 10 to 20 percent

Reaction: pH 6.6 to 7.8

Bt horizon

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: Sandy clay loam, fine sandy loam, or loam

Clay content: 15 to 30 percent—more than 45 percent fine and coarser sand

Bulk density: 1.40 to 1.60

Reaction: pH 6.6 to 7.8

Bk1 horizon

Chroma: 3 or 4

Clay content: 15 to 25 percent—20 to more than 45 percent fine and coarser sand

Bulk density: 1.40 to 1.60

Reaction: pH 7.4 to 8.4

2Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay loam or silty clay loam

Clay content: 27 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Bulk density: greater than 1.6

Reaction: pH 7.4 to 8.4

2C horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay loam or silty clay loam

Clay content: 27 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

Note: Some pedons have a 2Bky horizon.

191B—Kenilworth fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Composition

Major Components

Kenilworth and similar soils: 85 percent

Minor Components

Kenilworth loamy sand: 0 to 10 percent

Telstad and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 10.4 inches

19B—Kenilworth loam, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Composition

Major Components

Kenilworth and similar soils: 85 percent

Minor Components

Nunemaker and similar soils: 0 to 7 percent

McKenzie and similar soils: 0 to 1 percent

Elloam and similar soils: 0 to 7 percent

Major Component Description

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium or eolian material
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.5 inches

Kevin Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landforms: Till plains or hills
Parent material: Glacial till
Slope range: 0 to 25 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free Season: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Kevin clay loam, 0 to 4 percent slopes, in a cropland area, 500 feet north and 1,580 feet east of the southwest corner of sec. 18, T. 33 N., R. 2 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; many very fine roots and many fine discontinuous pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bt—5 to 9 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; strong coarse prismatic structure parting to strong coarse subangular blocky structure; hard, firm, sticky and plastic; many very fine roots and discontinuous pores; common distinct clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Bk1—9 to 24 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine roots and discontinuous pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—24 to 40 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse angular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots and common very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—40 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots and common very fine pores; moderately alkaline.

Range in Characteristics

Control section: 5 to 40 inches
Mollic epipedon thickness: 7 to 12 inches
Content of clay in the control section: 27 to 35 percent
Depth to Bk horizon: Less than 10 inches

Ap horizon
 Hue: 10YR, 2.5Y, or 5Y
 Chroma: 2 or 3
 Clay content: 27 to 32 percent
 Reaction: pH 6.6 to 8.4

Bt horizon
 Hue: 10YR, 2.5Y, or 5Y
 Value: 4 or 5 dry; 3 or 4 moist
 Chroma: 2 or 3
 Texture: Clay loam or clay
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 15 percent
 Reaction: pH 6.6 to 8.4

Bk horizons
 Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 27 to 35 percent
 Rock fragments: 0 to 15 percent pebbles
 Moist bulk density: 1.6 to 1.8 gram/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0

C horizon
 Hue: 10YR, 5Y, or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Clay content: 27 to 35 percent
 Rock fragments: 0 to 15 percent
 Moist bulk density: 1.6 to 1.8 gram/cm
 Calcium carbonate equivalent: 1 to 10 percent
 Gypsum: 0 to 2 percent
 Reaction: pH 7.9 to 9.0
Note: Some pedons have a By horizon.

44B—Kevin clay loam, 0 to 4 percent slopes***Setting***

Landform: Till plains
Slope: 0 to 4 percent

Composition**Major Components**

Kevin and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent:
0 to 5 percent
Kevin clay loam calcareous: 0 to 5 percent
Elloam and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

44C—Kevin clay loam, 4 to 8 percent slopes***Setting***

Landform: Till plains
Slope: 4 to 8 percent

Composition**Major Components**

Kevin and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent:
0 to 5 percent
Kevin clay loam calcareous: 0 to 5 percent
Elloam and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None

Available water capacity: 9.8 inches

445B—Kevin complex, 0 to 4 percent slopes***Setting***

Landforms: Kevin—till plains; Kevin, calcareous—till plains
Slope: Kevin—0 to 4 percent; Kevin, calcareous—0 to 4 percent

Composition**Major Components**

Kevin and similar soils: 50 percent
Kevin, calcareous and similar soils: 35 percent

Minor Components

Elloam and similar soils: 0 to 7 percent
Nishon and similar soils: 0 to 1 percent
Soils that have slopes more than 4 percent:
0 to 7 percent

Major Component Description**Kevin**

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

Kevin, calcareous

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

445C—Kevin complex, 4 to 8 percent slopes***Setting***

Landforms: Kevin, calcareous—till plains; Kevin—till plains

Position on landform: Kevin, calcareous—back slopes; Kevin—foot slopes
Slope: Kevin, calcareous—4 to 8 percent; Kevin—4 to 8 percent

Composition

Major Components

Kevin, calcareous and similar soils: 50 percent
Kevin and similar soils: 35 percent

Minor Components

Elloam and similar soils: 0 to 7 percent
Nishon and similar soils: 0 to 1 percent
Soils that have slopes more than 8 percent: 0 to 7 percent

Major Component Description

Kevin, calcareous

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

444B—Kevin, calcareous-Ferd complex, 0 to 4 percent slopes

Setting

Landforms: Kevin, calcareous—till plains; Ferd—till plains
Slope: Kevin, calcareous—2 to 4 percent; Ferd—0 to 4 percent

Composition

Major Components

Kevin, calcareous and similar soils: 45 percent
Ferd and similar soils: 40 percent

Minor Components

Acel and similar soils: 0 to 13 percent
Nishon and similar soils: 0 to 2 percent

Major Component Description

Kevin, calcareous

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

Ferd

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.6 inches

446C—Kevin-Elloam clay loams, 2 to 8 percent slopes

Setting

Landforms: Kevin—till plains; Elloam—till plains
Position on landform: Elloam—microlows
Slope: Kevin—4 to 8 percent; Elloam—2 to 4 percent

Composition

Major Components

Kevin and similar soils: 55 percent
Elloam and similar soils: 35 percent

Minor Components

Kevin clay loam calcareous: 0 to 2 percent
Nishon and similar soils: 0 to 2 percent
Absher and similar soils: 0 to 2 percent
Slickspots: 0 to 2 percent

Major Component Description

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till

Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.8 inches

Elloam

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 6.6 inches

443B—Kevin-Ferd complex, 0 to 4 percent slopes

Setting

Landforms: Kevin—till plains; Ferd—till plains
 Slope: Kevin—2 to 4 percent; Ferd—0 to 2 percent

Composition

Major Components

Kevin and similar soils: 45 percent
 Ferd and similar soils: 40 percent

Minor Components

Elloam and similar soils: 0 to 5 percent
 Nishon and similar soils: 0 to 2 percent
 Absher and similar soils: 0 to 4 percent
 Soils that have slopes more than 8 percent:
 0 to 4 percent

Major Component Description

Kevin

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.8 inches

Ferd

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

441C—Kevin-Hillon clay loams, 2 to 8 percent slopes

Setting

Landforms: Kevin—till plains; Hillon—till plains
 Position on landform: Kevin—foot slopes; Hillon—back slopes
 Slope: Kevin—2 to 4 percent; Hillon—4 to 8 percent

Composition

Major Components

Kevin and similar soils: 55 percent
 Hillon and similar soils: 35 percent

Minor Components

Soils that have slopes more than 8 percent:
 0 to 4 percent
 Soils that are ponded: 0 to 2 percent
 Elloam and similar soils: 0 to 4 percent

Major Component Description

Kevin

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.8 inches

Hillon

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.9 inches

Kiwanis Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Typic Ustifluvents

Texture: Coarse loam or sandy loam
Clay content: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Typical Pedon

Kiwanis fine sandy loam in an area of Korchea-Kiwanis complex, 0 to 2 percent slopes; in a rangeland area, 600 feet east and 300 feet north of the southwest corner of sec. 5, T. 31 N., R. 9 W.

A1—0 to 5 inches; grayish brown (2.5Y 5/2) fine sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; many fine and coarse roots; neutral; clear smooth boundary.

A2—5 to 15 inches; light grayish brown (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure; hard, very friable, nonsticky and nonplastic; many fine and coarse roots; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—15 to 29 inches; grayish brown (2.5Y 5/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine and few coarse roots; slightly effervescent; mildly alkaline; clear wavy boundary.

C2—29 to 36 inches; grayish brown (2.5Y 5/2) sandy loam, very dark grayish brown (2.5Y 3/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine and few coarse roots; slightly effervescent; mildly alkaline; clear wavy boundary.

2C3—36 to 60 inches; grayish brown (2.5Y 5/2) very gravelly sand; very dark grayish brown (2.5Y 3/2) moist; single grain; loose, nonsticky and nonplastic; few fine and medium roots; 40 percent gravels; slightly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 5 to 10 percent

Depth to 2C horizon: 20 to 40 inches

A horizons

Hue: 7.5YR through 2.5Y

Value: 4, 5, or 6 dry; 2, 3, or 4 moist

Texture: Fine sandy loam or sandy loam

Chroma: 2 or 3

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 7.8

C horizons

Hue: 7.5YR through 2.5Y

Value: 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist

Kobase Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landforms: Alluvial fans or lake plains

Parent material: Alluvium or glaciolacustrine deposits

Slope range: 0 to 8 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Borollic Camborthids

Typical Pedon

Kobase silty clay loam, 0 to 4 percent slopes, in a cropland area, 350 feet north and 2,500 feet west of the southeast corner of sec. 12, T. 33 N., R. 4 W.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and vesicular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—5 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; many very fine and fine roots and tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—12 to 18 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; common very fine and fine roots and many fine tubular pores; few medium soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—18 to 28 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 5/2) moist; weak medium angular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots and common fine tubular pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

By—28 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist;

massive; very hard, firm, sticky and plastic; few fine nests of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 35 to 45 percent

Depth to Bk horizon: 12 to 17 inches

Depth to the By horizon: 25 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 1, 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

Bk2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: 7.9 to 9.0

By horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 1, 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

Note: Some pedons have thin strata of silt loam or loam below depths of 40 inches and a BCy or Byz horizon.

32B—Kobase silty clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition

Major Components

Kobase and similar soils: 85 percent

Minor Components

Kobar, calcareous: 0 to 8 percent

McKenzie and similar soils: 0 to 2 percent

Marvan and similar soils: 0 to 3 percent

Vanda and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.8 inches

32C—Kobase silty clay loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 4 to 8 percent

Composition

Major Components

Kobase and similar soils: 85 percent

Minor Components

Trudau and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 5 percent

Ethridge and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.8 inches

**321B—Kobase silty clay loam,
calcareous, 0 to 4 percent slopes****Setting**

Landform: Alluvial fans
Slope: 0 to 4 percent

Composition**Major Components**

Kobase and similar soils: 85 percent

Minor Components

Marvan and similar soils: 0 to 5 percent
Vanda and similar soils: 0 to 5 percent
Soils that have noncalcareous surface layers: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

**321C—Kobase silty clay loam,
calcareous, 4 to 8 percent slopes****Setting**

Landform: Alluvial fans
Slope: 4 to 8 percent

Composition**Major Components**

Kobase and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers: 0 to 5 percent
Soils that have slopes less than 4 percent: 0 to 4 percent
Marvan and similar soils: 0 to 3 percent
Vanda and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland

Flooding: None
Available water capacity: 9.8 inches

Korchea Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Mollic Ustifluvents

Typical Pedon

Korchea loam in an area of Korchea-Kiwanis complex, 0 to 2 percent slopes; in a rangeland area, 1,300 feet south and 1,200 feet east of the northwest corner of sec. 20, T. 31 N., R. 8 W.

- A1—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark gray (10YR 3/1) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; slightly effervescent; mildly alkaline; gradual wavy boundary.
- A2—7 to 14 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure; slightly hard, very friable, nonsticky and nonplastic; slightly effervescent; mildly alkaline; gradual smooth boundary.
- C1—14 to 24 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; gradual smooth boundary.
- C2—24 to 37 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.
- C3—37 to 60 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; few medium distinct light olive brown (2.5Y 6/4) or light yellowish brown (2.5Y 5/6) mottles; massive; hard, firm, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 18 to 27 percent

A horizon

Hue: 10YR or 2.5Y
 Value: 3, 4, or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 18 to 27 percent
 Reaction: pH 6.6 to 8.4

C horizons

Hue: 2.5Y or 10YR, but 5Y is in the range
 Value: 4, 5, 6, or 7 dry; 3, 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loam, silt loam, silty clay loam, clay loam, fine sandy loam, sandy loam, or very fine sandy loam
 Clay content: 18 to 35 percent
 Reaction: pH 7.4 to 9.0
Note: Layers of coarser or finer textures are in some pedons at depths of 40 to 60 inches.

110A—Korchea-Kiwanis complex, 0 to 2 percent slopes

Setting

Landforms: Korchea—flood plains; Kiwanis—flood plains
 Slope: Korchea—0 to 2 percent; Kiwanis—0 to 2 percent

Composition

Major Components

Korchea and similar soils: 45 percent
 Kiwanis and similar soils: 45 percent

Minor Components

Areas of riverwash: 0 to 3 percent
 Bigsandy and similar soils: 0 to 5 percent
 Nesda and similar soils: 0 to 2 percent

Major Component Description

Korchea

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Rare
 Available water capacity: 10.1 inches

Kiwanis

Surface layer texture: Fine sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Rare
 Available water capacity: 5.8 inches

Kremlin Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Haploborolls

Typical Pedon

Kremlin loam, 0 to 4 percent slopes, in a cropland area, 2,410 feet north and 10 feet west of the southeast corner of sec. 35, T. 32 N., R. 1 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; mildly alkaline; abrupt smooth boundary.

Bw—7 to 16 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium prismatic structure; hard, friable, slightly sticky and plastic; few very fine roots and discontinuous pores; mildly alkaline; clear wavy boundary.

Bk1—16 to 27 inches; light brownish gray (10YR 6/2) loam, brown (10YR 4/3) moist; weak medium prismatic structure; hard, friable, sticky and plastic; few very fine roots and discontinuous pores; few fine rounded soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—27 to 40 inches; light brownish gray (10YR 6/2) loam, brown (10YR 5/3) moist; weak medium prismatic structure; hard, friable, sticky and plastic; few very fine roots and discontinuous pores; common fine rounded soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—40 to 60 inches; light brownish gray (10YR 6/2) clay loam, brown (10YR 5/3) moist; weak coarse angular blocky structure; hard, firm, sticky and plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 7 to 15 inches; in some pedons it includes all or part of the Bw1 horizon

Content of clay in the control section: 18 to 30 percent

Depth to Bk horizon: 10 to 24 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Calcium carbonate equivalent: 5 to 15 percent for calcareous phase

Reaction: pH 6.1 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, silt loam, clay loam, or sandy clay loam

Clay content: 18 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent for the calcareous phase

Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loam, silt loam, clay loam, or sandy clay loam

Clay content: 18 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Bk2 and BC horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, clay loam, or sandy clay loam

Clay content: 18 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

98B—Kremlin loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition

Major Components

Kremlin and similar soils: 85 percent

Minor Components

Kremlin loam calcareous: 0 to 3 percent

Trudau and similar soils: 0 to 3 percent

Chinook and similar soils: 0 to 3 percent

Yamac and similar soils: 0 to 3 percent

Evanston and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 10.4 inches

Lambeth Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderately slow (0.2 to 0.6 inch/hour)

Landforms: Hills or escarpments

Parent material: Glaciofluvial or glaciolacustrine deposits

Slope range: 15 to 70 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-silty, mixed (calcareous), frigid Aridic Ustorthents

Typical Pedon

Lambeth silt loam, in an area of Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes; in a rangeland area, 1,000 feet north and 500 feet west of the southeast corner of sec. 16, T. 30 N., R. 1 W.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (10YR 5/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and plastic; common fine roots

and few very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

By1—4 to 9 inches; pale yellow (2.5Y 7/4) silt loam, brown (10YR 5/3) moist; moderate medium platy structure; slightly hard, very friable, slightly sticky and plastic; few fine roots and very fine pores; common medium threads of gypsum; strongly effervescent; moderately alkaline; gradual wavy boundary.

By2—9 to 60 inches; pale yellow (2.5Y 7/4) silt loam, brown (10YR 5/3) moist; moderate thick platy structure; slightly hard, very friable, slightly sticky and plastic; few very fine roots and pores; common medium threads of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 20 to 35 percent

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 20 to 27 percent

Reaction: pH 6.6 to 8.4

By horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam with thin bands of loam, fine sandy loam, or very fine sandy loam

Clay content: 20 to 35 percent

Gypsum: 1 to 6 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

Note: Some pedons have a Bk or Bky horizon; the bands are remnants from lacustrine sediments.

15F—Lambeth silt loam, 15 to 70 percent slopes

Setting

Landform: Hills

Slope: 15 to 70 percent

Composition

Major Components

Lambeth and similar soils: 85 percent

Minor Components

Lonna and similar soils: 0 to 5 percent

Busby and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 11.4 inches

Lihen Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat excessively drained

Permeability: Rapid (6.0 to 20.0 inches/hour)

Landforms: Alluvial fans or hills

Parent material: Alluvium or eolian deposits

Slope range: 0 to 25 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Sandy, mixed Entic Haploborolls

Typical Pedon

Lihen loamy sand in an area of Lihen-Blanchard loamy sands, 8 to 25 percent slopes; in a rangeland area, 2,200 feet south and 1,700 feet west of the northeast corner of sec. 19, T. 36 N., R. 2 E.

A1—0 to 5 inches; brown (10YR 4/3) loamy sand; dark brown (10YR 3/3) moist; moderate very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and pores; neutral; abrupt smooth boundary.

A2—5 to 10 inches; very dark grayish brown (10YR 3/2) loamy sand; brown (10YR 5/3) moist; moderate fine prismatic structure; soft, very friable, nonsticky and nonplastic; common very fine roots and pores; neutral; clear smooth boundary.

AC—10 to 30 inches; brown (10YR 4/3) loamy sand; dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots and pores; neutral; gradual wavy boundary.

C—30 to 60 inches; light yellowish brown (2.5Y 6/4) sand; olive brown (2.5Y 4/4) moist; single grain;

loose, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 12 to 30 inches

Content of clay in the control section: 0 to 10 percent

A horizons

Hue: 10YR or 2.5Y

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Texture: Fine sandy loam or loamy sand (textures of fine sandy loam do not extend below a depth of 9 inches)

Clay content: 5 to 20 percent

Reaction: pH 6.1 to 8.4

AC horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 3, 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loamy fine sand, loamy sand, fine sand, or sand

Clay content: 0 to 10 percent

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loamy fine sand, loamy sand, fine sand, or sand

Clay content: 0 to 10 percent

Calcium carbonate equivalent: 0 to 12 percent

Reaction: pH 7.4 to 8.4

551E—Lihen-Blanchard loamy sands, 8 to 25 percent slopes

Setting

Landforms: Lihen—hills; Blanchard—hills

Position on landform: Lihen—back slopes; Blanchard—shoulders

Slope: Lihen—8 to 25 percent; Blanchard—8 to 25 percent

Composition

Major Components

Lihen and similar soils: 50 percent

Blanchard and similar soils: 35 percent

Minor Components

Soils that have slopes less than 8 percent: 0 to 10 percent

Soils that have loam surface layers: 0 to 5 percent

Major Component Description

Lihen

Surface layer texture: Loamy sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.1 inches

Blanchard

Surface layer texture: Loamy sand

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.0 inches

Lonna Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans

Parent material: Alluvium

Slope range: 0 to 8 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-silty, mixed, frigid Aridic Ustochrepts

Typical Pedon

Lonna silty clay loam, 4 to 8 percent slopes, in a cropland area, 3,600 feet south and 300 feet east of the northwest corner of sec. 21, T. 34 N., R. 3 W.

Ap—0 to 5 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and many very fine pores;

strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—5 to 11 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots, common very fine and fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—11 to 35 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots and common very fine and fine pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—35 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots and common very fine and fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 18 to 35 percent

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 8.4

Note: Uncultivated areas have A horizons 2 to 4 inches thick.

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 8.4

Note: This horizon may be noneffervescent in some pedons.

Bk horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.9 to 8.4

BC horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Very fine sandy loam, loam, silt loam, or silty clay loam (may be stratified)

Clay content: 10 to 35 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.9 to 8.4

58B—Lonna silt loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition

Major Components

Lonna and similar soils: 85 percent

Minor Components

Soils that have slopes more than 4 percent:
0 to 4 percent

Lonna silt loam calcareous: 0 to 4 percent

Ferd and similar soils: 0 to 4 percent

Ethridge and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.8 inches

581B—Lonna silty clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition**Major Components**

Lonna and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers:
0 to 10 percent

Busby and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 8.8 inches

581C—Lonna silty clay loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans
Slope: 4 to 8 percent

Composition**Major Components**

Lonna and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers: 0 to 10 percent

Busby and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 8.8 inches

582B—Lonna-Ethridge complex, 0 to 4 percent slopes**Setting**

Landforms: Lonna—alluvial fans; Ethridge—alluvial fans

Slope: Lonna—0 to 4 percent; Ethridge—0 to 4 percent

Composition**Major Components**

Lonna and similar soils: 45 percent
Ethridge and similar soils: 40 percent

Minor Components

Busby and similar soils: 0 to 8 percent
Marias and similar soils: 0 to 7 percent

Major Component Description**Lonna**

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 8.8 inches

Ethridge

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

Macar Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed, frigid Typic Ustochrepts

Typical Pedon

Macar loam, 8 to 15 percent slopes, in a cropland area, 2,200 feet north and 2,350 feet west of the southeast corner of sec. 14, T. 37 N., R. 3 W.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; mildly alkaline; abrupt smooth boundary.

Bw—6 to 12 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate coarse subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and tubular pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Bk1—12 to 16 inches; brown (10YR 5/3) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and pores; strongly effervescent; few medium soft masses of lime; moderately alkaline; gradual wavy boundary.

Bk2—16 to 26 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 5/2) moist; weak fine medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; violently effervescent; common fine soft masses of lime; moderately alkaline; diffuse wavy boundary.

Bky—26 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots and common very fine and fine pores; violently effervescent; few fine soft masses of lime; few fine soft masses of gypsum; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 18 to 35 percent

Depth to Bk horizon: 11 to 24 inches

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 8.4

Note: A thin dark colored A horizon that does not meet the requirements for a mollic epipedon after mixing to 7 inches is allowed.

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 2, 3, 4, or 6

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 9.0; saline phase pH 8.5 to 9.0.

Bk1 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, 4, or 6

Texture: Clay loam, loam, or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.4 to 9.0

Bk2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, 4, or 6

Texture: Clay loam, loam, silt loam, sandy clay loam, or silty clay loam (some fine strata of sandy loam and fine sandy loam are in some pedons)

Clay content: 18 to 35 percent—35 to 55 percent fine sand and coarser

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.4 to 9.0

BC horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, 4, or 6

Texture: Loam, silt loam or silty clay loam consisting of strata of very fine sandy loam, sandy clay loam, and silt loam

Clay content: 15 to 30 percent

Calcium carbonate equivalent: 5 to 12 percent

Reaction: pH 7.9 to 9.0

961B—Macar clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition

Major Components

Macar and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers: 0 to 8 percent

Bigsandy and similar soils: 0 to 2 percent

Blanchard and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.9 inches

96C—Macar loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans
 Slope: 4 to 8 percent

Composition**Major Components**

Macar and similar soils: 85 percent

Minor Components

Macar loam calcareous: 0 to 10 percent
 Daglum and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.7 inches

96D—Macar loam, 8 to 15 percent slopes**Setting**

Landform: Alluvial fans
 Slope: 8 to 15 percent

Composition**Major Components**

Macar and similar soils: 85 percent

Minor Components

Macar loam calcareous: 0 to 10 percent
 Daglum and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.7 inches

Marias Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch/hour)
Landforms: Alluvial fans or lake plains
Parent material: Glaciofluvial or glaciolacustrine deposits
Slope range: 0 to 4 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid
 Chromic Udic Haplusterts

Typical Pedon

Marias silty clay, 0 to 4 percent slopes, in a cropland area, 250 feet south and 2,500 feet east of the northwest corner of sec. 36, T. 32 N., R. 2 W.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate fine granular structure; hard, firm, sticky and plastic; common very fine roots and continuous pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.
 Bss1—5 to 10 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong very fine and fine angular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots and continuous pores; common slickensides intersecting at 40 degrees from horizontal; mildly alkaline; clear smooth boundary.
 Bss2—10 to 23 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; few very fine roots and common fine continuous pores; common slickensides intersecting at 40 degrees from horizontal; slightly effervescent; moderately alkaline; clear smooth boundary.
 Bkss—23 to 27 inches; light grayish brown (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine prismatic structure; hard, firm, sticky and plastic; common very fine roots and common fine tubular pores; common slickensides intersecting at 40 degrees from horizontal;

common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bssy—27 to 60 inches; dark grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 4/2) moist; strong fine and medium angular blocky structure; extremely hard, extremely firm, very sticky and very plastic; few very fine roots and pores; common slickensides intersecting at 40 degrees from horizontal; common fine and medium soft masses and seams of gypsum; slightly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 40 to 60 percent

Depth to the Bssy horizon: 20 to 45 inches

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4.

Bss and Bkss horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay or silty clay

Clay content: 35 to 60 percent clay

Slickensides: Common to many

Electrical conductivity: 2 to 4

Reaction: pH 7.9 to 9.0

Bssy horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Texture: Clay or silty clay

Clay content: 35 to 60

Gypsum: 1 to 6 percent

Electrical conductivity: 2 to 4 mmhos/cm above a depth of 30 inches and 2 to 8 mmhos/cm below

Reaction: pH 7.9 to 9.0

47B—Marias silty clay, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition

Major Components

Marias and similar soils: 90 percent

Minor Components

Ethridge and similar soils: 0 to 4 percent

McKenzie and similar soils: 0 to 2 percent

Kobar and similar soils: 0 to 4 percent

Major Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.5 inches

Marmarth Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landforms: Sedimentary plains or till plains

Parent material: Residuum weathered from semiconsolidated sandstone or in glacial till materials deposited over these soft sedimentary beds

Slope range: 4 to 8 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Marmarth loam in an area of Marmarth-Evanston loams, 0 to 8 percent slopes; in a rangeland area, 3,000 feet east and 500 feet south of the northwest corner of sec. 23, T. 36 N., R. 1 W.

A—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and many very fine pores; neutral; clear wavy boundary.

Bt1—3 to 8 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common distinct

clay films on faces of peds; common very fine and fine roots and many very fine pores; neutral; clear wavy boundary.

Bt2—8 to 11 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine pores; few faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk—11 to 24 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5YR 5/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and many very fine pores; many fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C—24 to 32 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; loose, nonsticky and nonplastic; few very fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—32 to 60 inches; light yellowish brown (2.5Y 6/4) semiconsolidated sandstone, light olive brown (2.5Y 5/4) moist; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 3 to 11 inches

Mollic epipedon thickness: 7 to 12 inches

Content of clay in the control section: 18 to 35 percent

Depth to semiconsolidated bedrock: 20 to 40 inches

Depth to Bk horizon: 10 to 20 inches

A horizon

Hue: 10YR

Value: 3, 4, or 5 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Reaction: pH 6.1 to 7.3

Bt horizons

Hue: 10YR or 2.5Y

Value: 3, 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or sandy clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.1 to 7.8

Bk and C horizons

Hue: 2.5Y or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, fine sandy loam, or clay loam

Clay content: 15 to 35 percent

Reaction: pH 7.4 to 8.4

Cr horizon

Texture: Soft sandstone or stratified soft sandstone and siltstone

Reaction: pH 7.4 to 8.4

241C—Marmarth-Evanston loams, 0 to 8 percent slopes

Setting

Landforms: Marmarth—sedimentary plains;

Evanston—drainageways

Slope: Marmarth—4 to 8 percent; Evanston—0 to 4 percent

Composition

Major Components

Marmarth and similar soils: 50 percent

Evanston and similar soils: 35 percent

Minor Components

Soils that have slopes more than 8 percent:
0 to 8 percent

McKenzie and similar soils: 0 to 1 percent

Gerdrum and similar soils: 0 to 3 percent

Absher and similar soils: 0 to 3 percent

Major Component Description

Marmarth

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.2 inches

Evanston

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 10.0 inches

Marvan Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (less than 0.06 inch/hour)

Landforms: Alluvial fans or lake plains

Parent material: Alluvium or glaciolacustrine deposits

Slope range: 0 to 8 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid
Sodic Haplusterts

Typical Pedon

Marvan silty clay, 0 to 4 percent slopes, in a cropland area, 1,400 feet west and 2,400 feet south of the northeast corner of sec. 6, T. 33 N., R. 3 W.

Ap—0 to 7 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; very hard, firm, very sticky and very plastic; many very fine and fine roots and many fine pores; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bss—7 to 23 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; many very fine and fine roots and pores; few slickensides intersecting at 40 degrees from horizontal; strongly effervescent; strongly alkaline; clear wavy boundary.

Bssyz—23 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; common fine roots and pores; few slickensides intersecting at 40 degrees from horizontal; few fine soft masses and nests of gypsum and other salts; strongly effervescent; strongly alkaline; clear wavy boundary.

Bnyz—30 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, very sticky and very plastic; few fine roots and few very fine and fine pores; few common soft masses and nests of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 45 to 60 percent
Depth to the Bssyz horizon: 10 to 24 inches

Ap horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 0 to 8 mmhos/cm; saline phase is 2 to 8 mmhos/cm

Sodium absorption ratio: 8 to 18 above a depth of 24 inches and 13 to 38 below that depth; where the SAR is 8 or less, the sodium plus magnesium is greater than calcium plus acidity

Reaction: pH 7.4 to 9.0

Bss horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay or silty clay

Clay content: 45 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium absorption ratio: 8 to 18; where the SAR is below 8, the sodium plus magnesium is greater than calcium plus acidity

Reaction: pH 7.9 to 9.0

Bssyz horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay or silty clay

Clay content: 45 to 60 percent

Gypsum: 1 to 5 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium absorption ratio: 8 to 18 above a depth of 24 inches and 13 to 38 below that depth; where the SAR is below 8, the sodium plus magnesium is greater than calcium plus acidity

Reaction: pH 7.9 to 9.0

Bnyz horizon

Hue: 2.5 or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Clay or silty clay that includes thin layers of silty clay loam and silt loam material

Clay content: 45 to 60 percent

Gypsum: 1 to 5 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 38

Reaction: pH 7.9 to 9.0

Note: Some pedons have a Bssyz horizon in place of the Bnyz horizon. When dry the soil has 1/4- to 1-inch cracks that extend to a depth of about 20 inches.

30B—Marvan silty clay, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition

Major Components

Marvan and similar soils: 85 percent

Minor Components

Vanda and similar soils: 0 to 5 percent

Yamac and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 6.9 inches

30C—Marvan silty clay, 4 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 4 to 8 percent

Composition

Major Components

Marvan and similar soils: 85 percent

Minor Components

Vanda and similar soils: 0 to 5 percent

Yamac and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 6.9 inches

McKenzie Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Poorly drained

Permeability: Very slow (less than 0.06 inch/hour)

Landform: Closed depressions

Parent material: Alluvium or glaciolacustrine deposits

Slope range: 0 to 2 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid
Chromic Endoaquerts

Typical Pedon

McKenzie silty clay, 0 to 1 percent slope, in a rangeland area, 2,000 feet north and 1,400 feet east of the southwest corner of sec. 16, T. 33 N., R. 3 W.

A—0 to 4 inches; light gray (10YR 6/1) silty clay, dark gray (10YR 4/1) moist; common fine and medium prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; very hard, firm, very sticky and very plastic; many very fine, fine, and medium roots, common very fine and fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bw—4 to 12 inches; light gray (10YR 6/1) clay, dark gray (10YR 4/1) moist; many fine and medium distinct dark brown (10YR 3/3) mottles; moderate medium subangular blocky structure; very hard, firm, very sticky and very plastic; common fine roots and common very fine and fine pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Byz1—12 to 24 inches; light grayish brown (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; many fine and medium distinct dark brown (10YR 3/3) mottles; weak medium subangular blocky structure; very hard, firm, very sticky and very

plastic; few fine roots and few very fine and fine pores; common fine and medium soft masses of gypsum and other salts; slightly effervescent; strongly alkaline; clear smooth boundary.

Byz2—24 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; many fine and medium distinct dark brown (10YR 3/3) mottles; massive; very hard, firm, very sticky and very plastic; many fine soft masses of gypsum and other salts; slightly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 40 to 60 percent

Depth to seasonal high water table: +.5 to 1 foot

Depth to the Byz horizon: 10 to 20 inches

A horizon

Hue: 5Y, 2.5Y, or 10YR

Value: 4 or 5 moist; 4, 5, or 6 dry

Chroma: 1 or 2

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 16 mmhos/cm; saline phase is 8 to 16

Reaction: pH 6.6 to 9.0

Note: The upper 1/16- to 1-inch is commonly a light gray vesicular crust.

Bw horizon

Hue: 2.5Y or 5Y

Value: 4 or 5 moist; 5 or 6 dry

Chroma: 1 or 2

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 16 mmhos/cm; saline phase is 8 to 16

Reaction: pH 7.9 to 9.0

Byz horizons

Hue: 2.5Y or 5Y

Value: 4, 5, or 6 moist; 5, 6, or 7 dry

Chroma: 1, 2, or 3

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 16 mmhos/cm; saline phase is 8 to 16

Gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

Note: Some pedons do not have a Byz horizons.

141A—McKenzie clay, saline, 0 to 2 percent slopes

Setting

Landform: Closed depressions

Slope: 0 to 2 percent

Composition

Major Components

McKenzie and similar soils: 85 percent

Minor Components

Slickspots: 0 to 10 percent

McKenzie clay: 0 to 5 percent

Major Component Description

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Ponding: Long

Salt affected: Saline within 30 inches

Available water capacity: 4.5 inches

14A—McKenzie silty clay, 0 to 1 percent slopes

Setting

Landform: Closed depressions

Slope: 0 to 1 percent

Composition

Major Components

McKenzie and similar soils: 90 percent

Minor Components

Soils that are silt loam: 0 to 5 percent

McKenzie silty clay saline: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Ponding: Long

Salt affected: Saline within 30 inches
Available water capacity: 9.0 inches

Meadowcreek Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed Fluvaquentic Haploborolls

Typical Pedon

Meadowcreek loam, 0 to 2 percent slopes, in a rangeland area, 650 feet south and 2,450 feet east of the northwest corner of sec. 16, T. 37 N., R. 2 E.

- A1—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, black (10YR 2/2) moist; strong very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and many very fine and fine pores; slightly effervescent; mildly alkaline; gradual wavy boundary.
- A2—9 to 16 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 2/1) moist; weak fine prismatic structure parting to moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine tubular pores; slightly effervescent; moderately alkaline; gradual wavy boundary.
- Bw—16 to 21 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine prismatic structure parting to moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine tubular pores; slightly effervescent; moderately alkaline; gradual wavy boundary.
- 2Cg—21 to 60 inches; light gray (2.5Y 7/2) extremely gravelly loamy sand, grayish brown (2.5Y 5/2) moist; common fine distinct dark brown (10YR 3/3) mottles; single grain; loose, nonsticky and nonplastic; 75 percent pebbles; strongly effervescent; neutral.

Range in Characteristics

Control section: 10 to 40 inches
Mollic epipedon thickness: 10 to 16 inches
Depth to seasonal high water table: 36 to 60 inches
Depth to 2C horizon: 20 to 35 inches

A horizons

Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 1 or 2
Clay content: 18 to 25 percent
Calcium carbonate equivalent: 0 to 10 percent
Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 1, 2, or 3
Texture: Loam, sandy loam, sandy clay loam, or silt loam
Clay content: 18 to 25 percent
Calcium carbonate equivalent: 0 to 10 percent
Reaction: pH 6.6 to 8.4

Note: Mottles may be a different color than the ranges given; some pedons have thin strata of fine sandy loam.

2Cg horizon

Hue: 2.5Y or 5Y
Texture: Sand or loamy sand
Clay content: 0 to 10 percent
Rock fragments: 50 to 75 percent—0 to 15 percent cobbles and stones, 50 to 70 percent pebbles
Reaction: pH 6.1 to 7.8

143A—Meadowcreek loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Composition

Major Components

Meadowcreek and similar soils: 85 percent

Minor Components

Enbar and similar soils: 0 to 5 percent
Bigsandy and similar soils: 0 to 5 percent
Korchea and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Somewhat poorly drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: Rare
 Water table: Apparent
 Available water capacity: 4.7 inches

M-W—Miscellaneous Water

Composition

Major Components

Miscellaneous water: 100 percent

Major Component Description

Definition: Areas of open water in sewage lagoons, industrial waste pits, fish hatcheries, etc.

Neldore Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landforms: Hills or escarpments
Parent material: Residuum weathered from shale
Slope range: 2 to 70 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents

Typical Pedon

Neldore clay in an area of Hillon-Neldore complex, 8 to 25 percent slopes; in a rangeland area, 2,500 feet south and 2,100 feet west of the northeast corner of sec. 27, T. 33 N., R. 3 W.

A—0 to 6 inches; grayish brown (10YR 5/2) clay, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; hard, very firm, sticky and plastic; few very fine roots and few very fine discontinuous pores; strongly effervescent; mildly alkaline; clear smooth boundary.

C—6 to 18 inches; gray (10YR 5/1) clay, dark brown (10YR 4/2) moist; weak medium subangular blocky structure parting to weak fine granular

structure; hard, very firm, sticky and plastic; few very fine roots and pores; common fine soft masses of lime; common medium nests of gypsum and other soluble salts; violently effervescent; mildly alkaline; gradual wavy boundary.

Cr—18 to 60 inches; gray (10YR 5/1) semiconsolidated shale, very dark gray (10YR 3/1) moist; neutral.

Range in Characteristics

Control section: 10 to 18 inches

Content of clay in the control section: 40 to 60 percent

Depth to semiconsolidated bedrock: 10 to 20 inches

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 1 or 2

Clay content: 40 to 50 percent

Rock fragments: 0 to 10 percent—0 to 5 percent stones and cobbles, 0 to 5 percent pebbles; the stones, cobbles, and pebbles in some pedons are from a thin glacial mantle that has been eroded away.

Reaction: pH 5.6 to 7.8

C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, 4, or 6 for stains of shale

Texture: Clay or silt clay

Clay content: 40 to 60 percent

Rock fragments: 5 to 35 percent—5 to 25 percent soft shale fragments, 0 to 10 percent hard shale fragments

Reaction: pH 5.6 through 7.8

Cr horizon

Note: The shale fragments are extremely hard or very hard when dry and extremely firm or very firm when moist.

Reaction: pH 5.1 through 7.3.

971C—Neldore-Bascovy clays, 2 to 8 percent slopes

Setting

Landforms: Neldore—sedimentary plains; Bascovy—sedimentary plains

Position on landform: Neldore—back slopes; Bascovy—foot slopes



Figure 4. Typical area of Neldore-Bascovy clays, 2 to 8 percent slopes. Neldore and similar soils: 45 percent.

Slope: Neldore—2 to 8 percent; Bascovy—2 to 8 percent

Composition

Major Components

Neldore and similar soils: 45 percent (fig. 4)
Bascovy and similar soils: 40 percent

Minor Components

Soils that have slopes more than 8 percent:
0 to 5 percent
Marias and similar soils: 0 to 5 percent
Marvan and similar soils: 0 to 5 percent

Major Component Description

Neldore

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained

Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 2.6 inches

Bascovy

Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 4.5 inches

971F—Neldore-Bascovy clays, 8 to 45 percent slopes

Setting

Landforms: Neldore—hills; Bascovy—hills

Position on landform: Neldore—shoulders; Bascovy—back slopes
Slope: Neldore—8 to 45 percent; Bascovy—8 to 45 percent

Composition

Major Components

Bascovy and similar soils: 35 percent

Minor Components

Soils that have slopes less than 8 percent: 0 to 5 percent
Marvan and similar soils: 0 to 5 percent
Vanda and similar soils: 0 to 5 percent

Major Component Description

Neldore

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 2.6 inches

Bascovy

Surface layer texture: Clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 4.5 inches

972F—Neldore-Lambeth-Rock outcrop complex, 35 to 70 percent slopes

Setting

Landforms: Neldore—hills; Lambeth—hills
Position on landform: Neldore—back slopes; Lambeth—foot slopes
Slope: Neldore—35 to 70 percent; Lambeth—35 to 70 percent; Rock outcrop—35 to 70 percent

Composition

Major Components

Neldore and similar soils: 35 percent
Lambeth and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Soils that have slopes less than 35 percent:
0 to 5 percent
Bascovy and similar soils: 0 to 5 percent
Cabbart and similar soils: 0 to 3 percent
Fleak and similar soils: 0 to 2 percent

Major Component Description

Neldore

Surface layer texture: Clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 2.6 inches

Lambeth

Definition: Surface exposures bare bedrock
Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 11.4 inches

Rock outcrop

Definition: Surface exposures bare bedrock

Nesda Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landforms: Flood plains or stream channels
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Sandy-skeletal, mixed
Fluventic Haploborolls

Typical Pedon

Nesda gravelly loam in an area of Nesda complex, 0 to 4 percent slopes, in a rangeland area, 300 feet south and 300 feet west of the northeast corner of sec. 11, T. 36 N., R. 1 E.

- A1—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 25 percent pebbles; neutral; clear smooth boundary.
- A2—5 to 12 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure parting to weak fine granular structure; soft, very friable; slightly sticky and slightly plastic; many very fine and fine roots and pores; 25 percent pebbles; neutral; clear smooth boundary.
- 2C1—12 to 17 inches; very pale brown (10YR 7/3) very gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; 30 percent pebbles; mildly alkaline; clear wavy boundary.
- 2C2—17 to 60 inches; light gray (10YR 7/2) very gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; few fine roots; 45 percent pebbles; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 10 to 16 inches

Content of clay in the control section: 0 to 10 percent

Depth to 2C horizon: 10 to 20 inches

A horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 1, 2, or 3

Clay content: 10 to 20 percent

Rock fragments: 0 to 65 percent—0 to 15 percent stones and cobbles, 0 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

2C horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1, 2, 3, or 4

Texture: Sand or loamy sand

Clay content: 0 to 10 percent

Rock fragments: 35 to 80 percent—0 to 15 percent stones and cobbles, 35 to 65 percent pebbles

Reaction: pH 7.4 to 8.4

Note: Some pedons have a buried A horizon above a depth of 40 inches.

871B—Nesda complex, 0 to 4 percent slopes

Setting

Landforms: Nesda—flood plains; Nesda, cool—stream channels

Slope: Nesda—0 to 4 percent; Nesda, cool—0 to 4 percent

Composition

Major Components

Nesda and similar soils: 45 percent

Nesda, cool and similar soils: 40 percent

Minor Components

Bigsandy and similar soils: 0 to 5 percent

Kiwanis and similar soils: 0 to 5 percent

Areas of riverwash: 0 to 5 percent

Major Component Description

Nesda

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: 3.4 inches

Nesda, cool

Surface layer texture: Very gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Occasional

Available water capacity: 3.0 inches

Nishon Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Poorly drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Closed depressions

Parent material: Alluvium

Slope range: 0 to 1 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine, montmorillonitic, frigid Typic Albaqualfs

Typical Pedon

Nishon clay loam, 0 to 1 percent slope, in a cropland area, 1,000 feet south and 1,700 feet east of the northwest corner of sec. 3, T. 36 N., R. 4 W.

Ap—0 to 4 inches; gray (10YR 6/1) clay loam, very dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and many fine vesicular pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bt1—4 to 14 inches; gray (10YR 5/1) clay, very dark gray (10YR 4/1) moist; many medium prominent brown (7.5YR 5/4) mottles; moderate medium and fine subangular blocky structure; very hard, very firm, sticky and plastic; common very fine roots and few very fine tubular pores; common distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bt2—14 to 22 inches; gray (10YR 5/1) clay, dark gray (10YR 4/1) moist; moderate medium subangular blocky structure; very hard, very firm, sticky and plastic; common very fine roots and few very fine tubular pores; common distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.

Bk1—22 to 33 inches; light gray (10YR 6/1) clay, dark gray (10YR 4/1) moist; moderate medium and fine angular blocky structure; very hard, very firm, sticky and plastic; few very fine roots and tubular pores; many medium soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—33 to 60 inches; light gray (10YR 6/1) clay, dark gray (10YR 4/1) moist; massive; very hard, very firm, sticky and plastic; few very fine roots and tubular pores; strongly effervescent; many medium soft masses of lime; moderately alkaline.

Range in Characteristics

Control section: 4 to 22 inches
Content of clay in the control section: 40 to 60 percent
Depth to seasonal high water table: 12 to 36 inches
Depth to Bk horizon: 16 to 34 inches

Ap horizon

Hue: 2.5Y or 10YR
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 1 or 2
 Mottles: Few to common (10YR 5/3, 4/3)
 Clay content: 27 to 35 percent
 Reaction: pH 6.1 to 8.4

Bt horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, or 6 dry; 3 or 4 moist
 Chroma: 0, 1, or 2
 Mottles: Few to common (10YR 5/3, 4/3, or 2.5Y 5/2, 5/3)
 Texture: Clay or silty clay
 Clay content: 40 to 60 percent
 Reaction: pH 6.6 to 9.0

Bk horizons

Hue: 2.5Y or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 0, 1, 2, or 3
 Mottles: Few to common (10YR 4/4, 6/4 moist)
 Texture: Clay loam, clay, or silty clay
 Clay content: 35 to 55 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0
Note: Some pedons have a C horizon.

28A—Nishon clay loam, 0 to 1 percent slopes

Setting

Landform: Closed depressions
 Slope: 0 to 1 percent

Composition

Major Components

Nishon and similar soils: 95 percent

Minor Components

Soils that are artificially drained: 0 to 3 percent
 McKenzie, saline: 0 to 1 percent
 Nishon clay: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Poorly drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None

Ponding: Long
Available water capacity: 9.3 inches

soluble salts; violently effervescent; moderately alkaline.

Nobe Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Moderately well drained
Permeability: Very slow (less than 0.06 inch/hour)
Landforms: Alluvial fans or stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic
(calcareous), frigid Oxyaquic Ustorthents

Typical Pedon

Nobe clay loam in an area of Absher-Nobe complex, 0 to 2 percent slopes; in a rangeland area, 1,400 feet south and 1,600 feet east of the northwest corner of sec. 8, T. 37 N., R. 1 W.

E—0 to 1 inch; light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure parting to moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; neutral; abrupt smooth boundary.

Bn—1 to 3 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium columnar structure parting to strong medium angular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and pores; common distinct clay films on faces of peds and lining pores; neutral; gradual wavy boundary.

Bknyz—3 to 17 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; soft, friable, sticky and plastic; many very fine and common fine roots, many very fine and fine pores; few fine soft masses of lime; few fine crystals of gypsum and other salts; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bnz1—17 to 34 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few fine filaments of soluble salts; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bnz2—34 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; few fine filaments of

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 35 to 60 percent

Depth to the Bknyz horizon: 4 to 6 inches

E horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Loam (when mixed to 7 inches it is clay loam or clay)

Clay content: 20 to 50 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 0 to 13

Reaction: pH 6.6 to 8.4

Bn horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 27 to 50 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium absorption ratio: 0 to 30

Reaction: pH 6.6 to 8.4

Note: This horizon in some areas is recognized as having characteristics of an argillic or cambic horizon but does not meet the minimum requirements of thickness for either one.

Bknyz and Bnz1 horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 30 mmhos/cm

Gypsum: 1 to 6 percent

Sodium absorption ratio: 13 to 40 percent

Reaction: pH 7.9 to 9.6

Bnz2 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam that is stratified with loam, clay loam, or silt loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 30 mmhos/cm

Gypsum: 1 to 6

Sodium absorption ratio: 13 to 70

Reaction: pH 7.9 to 9.6

64B—Nobe clay, 0 to 4 percent slopes**Setting**

Landform: Stream terraces
Slope: 0 to 4 percent

Composition**Major Components**

Nobe and similar soils: 85 percent

Minor Components

Ferd and similar soils: 0 to 5 percent
Gerdrum and similar soils: 0 to 5 percent
Evanston and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: 4.2 inches

Nunemaker Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch/hour)
Landform: Till plains
Parent material: Glaciofluvial deposits over glacial till
Slope range: 0 to 8 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Nunemaker silty clay loam, 0 to 4 percent slopes, in a rangeland area, 50 feet north and 2,200 feet east of the southwest corner of sec. 10, T. 32 N., R. 1 W.

A—0 to 4 inches; gray (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and plastic; common very fine and fine roots and few fine discontinuous pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—4 to 12 inches; gray (10YR 6/2) silty clay, very dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine and few fine roots, few very fine and fine pores; slightly effervescent; mildly alkaline; gradual wavy boundary.

Bk—12 to 21 inches; gray (10YR 6/2) clay, brown (10YR 4/3) moist; weak coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots and few fine roots and pores; few fine soft masses of lime; slightly effervescent; mildly alkaline; gradual wavy boundary.

Bky—21 to 60 inches; grayish brown (10YR 5/2) clay loam, brown (10YR 4/3) moist; massive; hard, friable, slightly sticky and plastic; few very fine roots; common soft masses of lime; few fine nests of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 35 to 55 percent

Depth to Bk horizon: 10 to 16 inches

A horizon

Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 35 to 40 percent
Rock fragments: 0 to 5 percent pebbles
Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Silty clay loam, clay, or silty clay
Clay content: 45 to 55 percent
Rock fragments: 0 to 5 percent pebbles
Reaction: pH 7.4 to 8.4

Note: The Bw horizon is formed in glaciofluvial material, while the Bk horizon is either glaciofluvial material or glacial till.

Bk horizon

Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay loam, silty clay loam, clay, or silty clay
Clay content: 35 to 50 percent
Rock fragments: 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

Bky horizons

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: Clay or clay loam (below 40 inches textures include sandy clay loam and loam)
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 20 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Gypsum: 1 to 5 percent
 Reaction: pH 7.9 to 9.0

29B—Nunemaker silty clay loam, 0 to 4 percent slopes***Setting***

Landform: Till plains
 Slope: 0 to 4 percent

Composition**Major Components**

Nunemaker and similar soils: 85 percent

Minor Components

Marvan and similar soils: 0 to 7 percent
 McKenzie and similar soils: 0 to 2 percent
 Vanda and similar soils: 0 to 6 percent

Major Component Description

Surface layer texture: Silty clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Glaciofluvial deposits
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.2 inches

29C—Nunemaker silty clay loam, 4 to 8 percent slopes***Setting***

Landform: Till plains
 Slope: 4 to 8 percent

Composition**Major Components**

Nunemaker and similar soils: 85 percent

Minor Components

Vanda and similar soils: 0 to 4 percent

McKenzie and similar soils: 0 to 2 percent
 Marvan and similar soils: 0 to 3 percent
 Soils that have slopes more than 8 percent: 0 to 3 percent
 Soils that have slopes less than 4 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Glaciofluvial deposits
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.2 inches

Perma Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Mountains
Parent material: Colluvium
Slope range: 2 to 70 percent
Annual precipitation: 18 to 22 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 70 to 105 days

Taxonomic Class: Loamy-skeletal, mixed Typic Haploborolls

Typical Pedon

Perma cobbly loam in an area of Perma-Whitlash cobbly loams, 25 to 70 percent slopes; in a rangeland area, 500 feet north and 1,300 feet east of the southwest corner of sec. 17, T. 36 N., R. 3 E.

A—0 to 10 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 15 percent pebbles and 10 percent cobbles; neutral; clear smooth boundary.

Bw1—10 to 20 inches; yellowish brown (10YR 5/4) very cobbly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots pores; 30 percent pebbles and 20 percent cobbles; neutral; clear smooth boundary.

Bw2—20 to 30 inches; yellowish brown (10YR 5/4) very cobbly loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure;

slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 35 percent pebbles and 20 percent cobbles; neutral; clear smooth boundary.

C—30 to 60 inches; pale brown (10YR 6/3) extremely cobbly loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots, few very fine and fine pores; 50 percent pebbles and 25 percent cobbles; neutral.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 10 to 15 inches

Content of clay in the control section: 7 to 20 percent

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 7 to 20 percent

Rock fragments: 15 to 35 percent—0 to 30 percent cobbles, stones, boulders, 10 to 35 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizons

Hue: 10YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or sandy loam

Clay content: 7 to 20 percent

Rock fragments: 35 to 85 percent—0 to 50 percent cobbles and stones, 25 to 65 percent pebbles

Reaction: pH 6.6 to 7.8

BC horizon

Hue: 10YR or 7.5YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam, loamy sand, or sandy loam

Clay content: 0 to 15 percent

Rock fragments: 60 to 85 percent—10 to 50 percent cobbles and stones, 50 to 65 percent pebbles

Reaction: pH 6.6 to 7.8

88C—Perma gravelly loam, 2 to 8 percent slopes

Setting

Landform: Mountains

Slope: 2 to 8 percent

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Soils that have slopes more than 8 percent:
0 to 5 percent

Whitlash and similar soils: 0 to 4 percent

Shambo and similar soils: 0 to 3 percent

Farnuf and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.1 inches

88E—Perma gravelly loam, 8 to 25 percent slopes

Setting

Landform: Mountains

Slope: 8 to 25 percent

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Soils that have slopes more than 25 percent: 0 to 5 percent

Whitlash and similar soils: 0 to 4 percent

Shambo and similar soils: 0 to 3 percent

Farnuf and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 4.1 inches

881E—Perma-Whitlash cobbly loams, 8 to 25 percent slopes**Setting**

Landforms: Perma—mountains; Whitlash—mountains
 Position on landform: Perma—back slopes;
 Whitlash—shoulders
 Slope: Perma—8 to 25 percent; Whitlash—8 to 25 percent

Composition**Major Components**

Perma and similar soils: 45 percent
 Whitlash and similar soils: 40 percent

Minor Components

Farnuf and similar soils: 0 to 5 percent
 Soils that have slopes less than 8 percent: 0 to 5 percent
 Rock outcrop: 0 to 5 percent

Major Component Description**Perma**

Surface layer texture: Cobbly loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Somewhat excessively drained
 Dominant parent material: Colluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 4.1 inches

Whitlash

Surface layer texture: Cobbly loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Colluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 1.9 inches

881F—Perma-Whitlash cobbly loams, 25 to 70 percent slopes**Setting**

Landforms: Perma—mountains; Whitlash—mountains
 Position on landform: Perma—back slopes;
 Whitlash—shoulders (fig. 5)
 Slope: Perma—25 to 70 percent; Whitlash—25 to 70 percent

Composition**Major Components**

Perma and similar soils: 45 percent
 Whitlash and similar soils: 40 percent

Minor Components

Farnuf and similar soils: 0 to 5 percent
 Soils that have slopes less than 25 percent:
 0 to 5 percent
 Rock outcrop: 0 to 5 percent

Major Component Description**Perma**

Surface layer texture: Cobbly loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Somewhat excessively drained
 Dominant parent material: Colluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 4.1 inches

Whitlash

Surface layer texture: Cobbly loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Colluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 1.9 inches

Phillips Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 4 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Eutroboralfs

Typical Pedon

Phillips clay loam, 0 to 4 percent slopes, in a rangeland area, 1,000 feet north and 1,000 feet east of the southwest corner of sec. 9, T. 34 N., R. 2 W.
 E—0 to 3 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate very fine

granular structure; soft, friable, slightly sticky and slightly plastic; many very fine roots and pores and many fine roots; many very fine pores; neutral; clear smooth boundary.

E/B—3 to 7 inches; about 60 percent pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist (E part); about 40 percent brown (10YR 5/3) clay loam, brown (10YR 4/3) moist (B part); moderate medium prismatic structure parting to strong thin and medium platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and pores and common fine pores; neutral; abrupt smooth boundary.

Bt—7 to 16 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; many very fine and common fine roots and common very fine pores;

many distinct clay films on faces of peds; neutral; gradual wavy boundary.

Btk—16 to 20 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and pores; common faint clay films on faces of peds; few fine soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk1—20 to 28 inches; light brownish gray (10YR 6/2) clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and few very fine pores; common fine and medium soft masses and seams of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

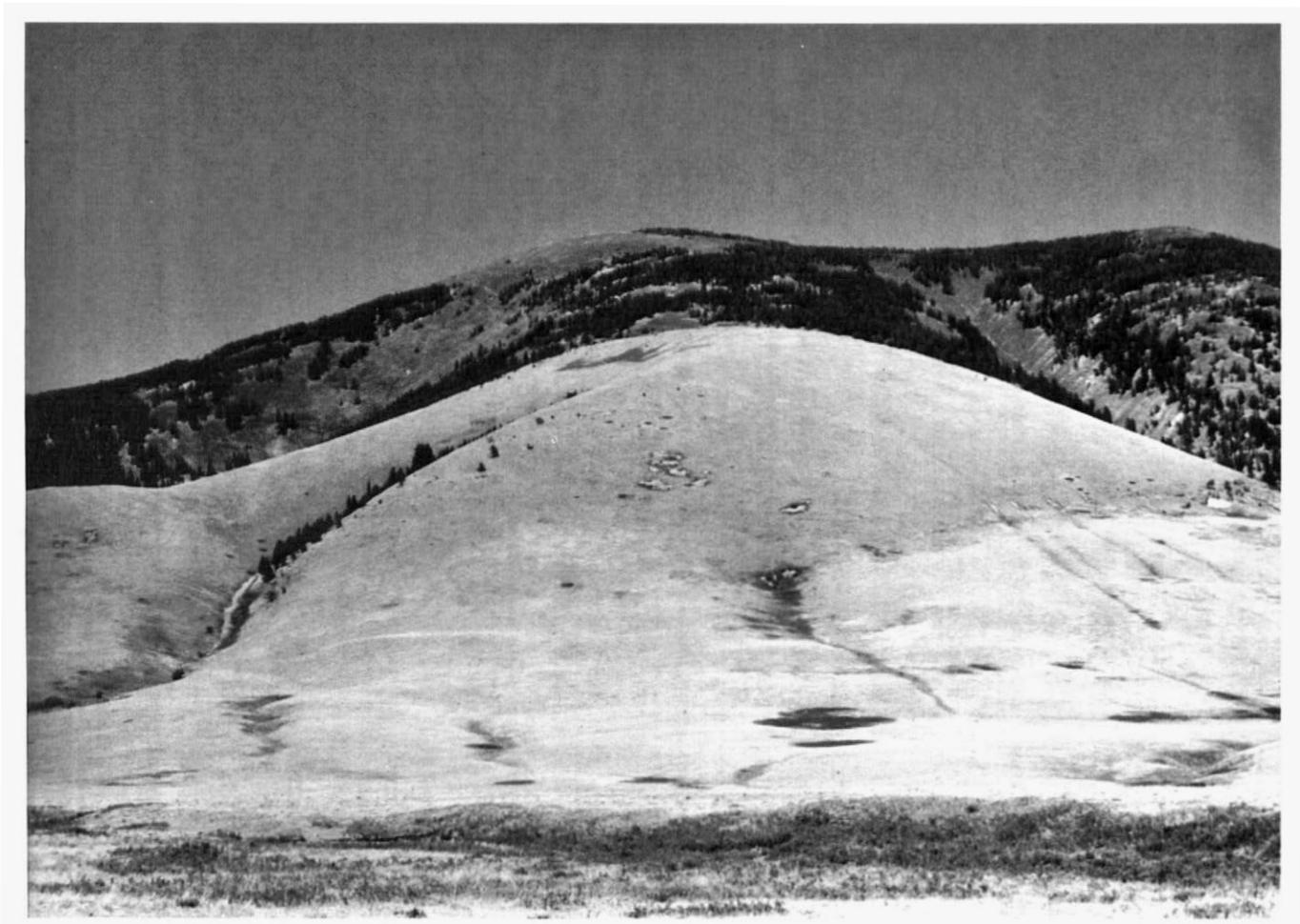


Figure 5. Typical area of Perma-Whitlash cobbly loams, 25 to 70 percent slopes, in the Sweetgrass Hills. Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes is in the forested background.

Bk2—28 to 42 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine pores; many fine and medium soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—42 to 60 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 7 to 20 inches

Content of clay in the control section: 35 to 45 percent

Depth to Bk horizon: 12 to 20 inches

E and E/B horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 8.4

Btk and Bk horizons

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 25 to 40 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: 4 to 8 mmhos/cm

Gypsum: 1 to 3 percent

Air dry bulk density: More than 1.6 g/cc

Reaction: pH 7.4 to 8.4

33B—Phillips clay loam, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Composition

Major Components

Phillips and similar soils: 85 percent

Minor Components

Elloam and similar soils: 0 to 7 percent

Nishon and similar soils: 0 to 2 percent

Absher and similar soils: 0 to 6 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.4 inches

331B—Phillips-Elloam clay loams, 0 to 4 percent slopes

Setting

Landforms: Phillips—till plains; Elloam—till plains

Position on landform: Phillips—microhighs; Elloam—microlows

Slope: Phillips—0 to 4 percent; Elloam—0 to 4 percent

Composition

Major Components

Phillips and similar soils: 50 percent

Elloam and similar soils: 35 percent

Minor Components

Slickspots: 0 to 5 percent

Nishon and similar soils: 0 to 2 percent

Elloam clay: 0 to 5 percent
 Acel and similar soils: 0 to 3 percent

Major Component Description

Phillips

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.4 inches

Elloam

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 6.6 inches

332B—Phillips-Kevin clay loams, 0 to 4 percent slopes

Setting

Landforms: Phillips—till plains; Kevin—till plains
 Slope: Phillips—0 to 4 percent; Kevin—0 to 4 percent

Composition

Major Components

Phillips and similar soils: 50 percent
 Kevin and similar soils: 35 percent

Major Component Description

Phillips

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.4 inches

Kevin

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till

Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.8 inches

Reeder Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains
Parent material: Residuum weathered from semiconsolidated interbedded sandstone and shale

Slope range: 0 to 8 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Reeder clay loam in an area of Reeder-Cabba complex, 0 to 4 percent slopes; in a cropland area, 2,000 feet east and 1,300 feet north of the southwest corner of sec. 5, T. 36 N., R. 4 W.

Ap—0 to 6 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, friable, slightly sticky and slightly plastic; common very fine roots and discontinuous pores; neutral; abrupt smooth boundary.

Bt—6 to 13 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure; hard, friable, slightly sticky and plastic; common very fine roots and discontinuous pores; few faint clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Bk—13 to 20 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/3) moist; weak coarse prismatic structure parting to weak moderate angular blocky structure; hard, friable, sticky and plastic; few very fine roots and pores; common fine shaped soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—20 to 32 inches; white (2.5Y 8/2) clay loam, light brownish gray (2.5Y 6/2) moist; strong thin platy structure; hard, friable, sticky and plastic; few very fine and fine roots and pores; disseminated lime; violently effervescent; moderately alkaline; abrupt smooth boundary.

Cr—32 to 60 inches; light gray (10YR 7/2) semiconsolidated interbedded sandstone and

shale, grayish brown (10YR 5/2) moist; slightly effervescent; moderately alkaline.

Range in Characteristics

Control section: 6 to 13 inches

Mollic epipedon thickness: 7 to 16 inches

Content of clay in the control section: 18 to 35 percent

Depth to semiconsolidated bedrock: 20 to 40 inches

Depth to Bk horizon: 11 to 26 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 33 percent

Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Texture: Loam, sandy clay loam, or clay loam

Clay content: Between 20 and 30 percent clay; ranges from 18 to 35 percent and from 20 to 45 percent fine sand and coarser

Reaction: pH 6.6 to 8.4

Bk and BC horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, silty clay loam, clay loam, or sandy clay loam

Clay content: 15 to 30 percent

Reaction: pH 7.4 to 8.4

Calcium carbonate equivalent: 6 to 20 percent

Cr horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist

Chroma: 1, 2, or 3

Texture: Loam, clay loam, or silty clay

Reaction: pH 7.4 to 8.4

411B—Reeder-Cabba complex, 0 to 4 percent slopes

Setting

Landforms: Reeder—sedimentary plains; Cabba—sedimentary plains

Position on landform: Cabba—shoulders

Slope: Reeder—0 to 4 percent; Cabba—0 to 4 percent

Composition

Major Components

Reeder and similar soils: 60 percent

Cabba and similar soils: 25 percent

Minor Components

Macar and similar soils: 0 to 5 percent

Farnuf and similar soils: 0 to 5 percent

Rock outcrop: 0 to 5 percent

Major Component Description

Reeder

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 5.0 inches

Cabba

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.3 inches

411C—Reeder-Cabba complex, 4 to 8 percent slopes

Setting

Landforms: Reeder—sedimentary plains; Cabba—sedimentary plains

Position on landform: Reeder—foot slopes; Cabba—shoulders

Slope: Reeder—4 to 8 percent; Cabba—4 to 8 percent

Composition

Major Components

Reeder and similar soils: 55 percent

Cabba and similar soils: 30 percent

Minor Components

Soils that have slopes more than 8 percent: 0 to 5 percent

Rock outcrop: 0 to 4 percent
 Macar and similar soils: 0 to 3 percent
 Farnuf and similar soils: 0 to 3 percent

Major Component Description

Reeder

Surface layer texture: Clay loam
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone
 and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 5.0 inches

Cabba

Surface layer texture: Fine sandy loam
 Depth class: Shallow (10 to 20 inches)
 Drainage class: Well drained
 Dominant parent material: Interbedded sandstone
 and shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 2.3 inches

2A—Riverwash

Composition

Major Components

Riverwash: 85 percent

Minor Components

Nesda and similar soils: 0 to 5 percent
 Rivra and similar soils: 0 to 5 percent
 Ryell and similar soils: 0 to 5 percent

Major Component Description

Definition: Unstabilized areas of sandy, silty, clayey,
 or gravelly sediments
 Flooding: Frequent

Rivra Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Aridic
 Ustifluvents

Typical Pedon

Rivra sandy loam in an area of Ryell-Rivra complex,
 0 to 2 percent slopes; in a rangeland area, 1,300
 feet south and 10 feet east of the northwest corner
 of sec. 36, T. 31 N., R. 2 W.

- A—0 to 5 inches; light gray (10YR 7/2) sandy loam,
 brown (10YR 5/3) moist; weak fine granular
 structure; soft, very friable, slightly sticky and
 slightly plastic; few very fine roots and
 discontinuous pores and few fine roots; strongly
 effervescent; mildly alkaline; clear wavy boundary.
- C1—5 to 18 inches; light brownish gray (10YR 6/2)
 gravelly loamy coarse sand, brown (10YR 5/3)
 moist; single grain; loose, nonsticky and
 nonplastic; many very fine and medium roots;
 25 percent pebbles; strongly effervescent;
 moderately alkaline; gradual wavy boundary.
- C2—18 to 60 inches; light brownish gray (10YR 6/2)
 extremely gravelly sand, brown (10YR 4/3) moist;
 single grain; loose, nonsticky and nonplastic; few
 fine roots; 60 percent pebbles and 15 percent
 cobbles; strongly effervescent; moderately
 alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 0 to 5 percent
Rock fragments in the control section: 55 to 80
 percent

A horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 5 to 15 percent
 Reaction: pH 6.6 to 8.4

C horizons

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: Sand or loamy coarse sand that consists
 of stratification of these and some finer sands
 Clay content: 0 to 5 percent
 Rock fragments: 55 to 80 percent—10 to 20
 percent stones and cobbles, 45 to 70 percent
 pebbles

Reaction: pH 7.4 to 8.4

Note: Thin buried A horizons do occur above 40 inches.

Roy Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderately slow (0.2 to 0.6 inch/hour)

Landform: Hills

Parent material: Colluvium

Slope range: 25 to 65 percent

Annual precipitation: 15 to 19 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 70 to 105 days

Taxonomic Class: Clayey-skeletal, mixed Typic Argiborolls

Typical Pedon

Roy gravelly clay loam, 25 to 60 percent slopes, in a rangeland area, 500 feet south and 400 feet west of the northeast corner of sec. 20. T. 37 N., R. 3 E.

A—0 to 6 inches; very dark grayish brown (10YR 4/2) gravelly clay loam, very dark brown (10YR 2/2) moist; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 20 percent pebbles; neutral; abrupt smooth boundary.

Bt1—6 to 10 inches; brown (10YR 4/3) very gravelly clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and pores; 35 percent pebbles and 10 percent cobbles; neutral; clear smooth boundary.

Bt2—10 to 25 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and common very fine and fine pores; 35 percent pebbles and 15 percent cobbles; neutral; gradual wavy boundary.

Bk—25 to 60 inches; brown (10YR 5/3) extremely gravelly clay loam, brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; 45 percent pebbles and 20 percent cobbles; mildly alkaline.

Range in Characteristics

Control section: 6 to 25 inches

Mollic epipedon thickness: 10 to 14 inches

Content of clay in the control section: 35 to 50 percent

Depth to Bk horizon: Greater than 20 inches

A horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Rock fragments: 15 to 35 percent—5 to 10 percent stones and cobbles, 10 to 25 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizons

Hue: 7.5YR or 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: Clay loam or clay

Clay content: 35 to 50 percent

Rock fragments: 35 to 80 percent—20 to 50 percent stones and cobbles, 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 7.5YR through 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3, 4, or 5

Texture: Clay loam or sandy clay loam

Clay content: 27 to 40 percent

Rock fragments: 35 to 80 percent—20 to 50 percent stones and cobbles, 15 to 30 percent pebbles

Calcium carbonate equivalent: 2 to 15 percent

Reaction: pH 7.4 to 8.4

71F—Roy gravelly clay loam, 25 to 60 percent slopes

Setting

Landform: Hills

Slope: 25 to 60 percent

Composition

Major Components

Roy and similar soils: 85 percent

Minor Components

Soils that have slopes less than 25 percent: 0 to 10 percent

Farnuf and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Colluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 4.3 inches

300F—Rubble land

Composition

Major Components

Rubble land: 85 percent

Minor Components

Soils with areas of scant vegetation: 0 to 15 percent

Major Component Description

Definition: Areas with more than 90 percent of the surface covered by stones and boulders, supporting little or no vegetation

Ryell Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour) to 26 inches; rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy over sandy or sandy-skeletal, mixed (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Ryell loam in an area of Ryell-Havre loams, 0 to 2 percent slopes; in a rangeland area, 2,000 feet south and 200 feet west of the northeast corner of sec. 4, T. 28 N., R. 3 W.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; soft, very friable, slightly

sticky and nonplastic; many fine and few medium roots and common fine pores; slightly effervescent; mildly alkaline; clear wavy boundary.

C1—5 to 16 inches; grayish brown (10YR 5/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak medium subangular blocky structure; hard, very friable, slightly sticky and nonplastic; many fine roots and pores and few medium roots; strongly effervescent; mildly alkaline; clear wavy boundary.

C2—16 to 26 inches; grayish brown (10YR 5/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots and pores; strongly effervescent; moderately alkaline; clear wavy boundary.

2C3—26 to 60 inches; brown (10YR 5/3) extremely gravelly loamy sand, dark brown (10YR 4/3) moist; single grain, loose, nonsticky and nonplastic; few fine and very fine roots on the upper part; 50 percent pebbles and 5 percent cobbles; coarse lime and lime crusts on the undersides of coarse fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 10 to 18 percent in the coarse-loamy horizons, 0 to 10 percent in the 2C horizon

Rock fragments in the control section: 35 to 70 percent

Depth to 2C horizon: 18 to 36 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Reaction: pH 7.4 to 8.4

C1 and C2 horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Very fine sandy loam, loamy very fine sand, or loam consisting of very fine sandy loam with thin strata of silt loam and/or fine sandy loam

Clay content: 10 to 18 percent

Rock fragments: 0 to 5 percent pebbles
Reaction: pH 7.4 to 8.4

2C3 horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Sand or loamy sand
Clay content: 0 to 10 percent
Rock fragments: 35 to 70 percent—0 to 15 percent cobbles, 35 to 55 percent pebbles
Reaction: pH 7.4 to 8.4

572A—Ryell-Havre loams, 0 to 2 percent slopes**Setting**

Landforms: Ryell—flood plains; Havre—flood plains
Slope: Ryell—0 to 2 percent; Havre—0 to 2 percent

Composition**Major Components**

Ryell and similar soils: 45 percent
Havre and similar soils: 40 percent

Minor Components

Bigsag and similar soils: 0 to 3 percent
Bigsandy and similar soils: 0 to 2 percent
Soils that are rarely flooded: 0 to 4 percent
Soils that are frequently flooded: 0 to 3 percent
Soils with areas of cottonwood trees: 0 to 3 percent

Major Component Description**Ryell**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: 5.3 inches

Havre

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium,
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: 9.7 inches

571A—Ryell-Rivra complex, 0 to 2 percent slopes**Setting**

Landforms: Ryell—flood plains; Rivra—flood plains
Slope: Ryell—0 to 2 percent; Rivra—0 to 2 percent

Composition**Major Components**

Ryell and similar soils: 50 percent
Rivra and similar soils: 35 percent

Minor Components

Havre and similar soils: 0 to 5 percent
Bigsag and similar soils: 0 to 3 percent
Bigsandy and similar soils: 0 to 2 percent
Soils that are frequently flooded: 0 to 5 percent

Major Component Description**Ryell**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: 5.3 inches

Rivra

Surface layer texture: Gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: 1.9 inches

Sagedale Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 2 to 8 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine, montmorillonitic, frigid Typic Ustochrepts

Typical Pedon

Sagedale silty clay loam, 2 to 8 percent slopes, in a cropland area, 1,500 feet south and 1,600 feet east of the northwest corner of sec. 5, T. 35 N., R. 4 W.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; hard, firm, sticky and plastic; common very fine roots and pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bw—5 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; hard, firm, sticky and plastic; few very fine roots and pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—12 to 35 inches; light gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure; hard, firm, sticky and plastic; few very fine roots and pores and few fine pores; few fine threads of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

C—35 to 60 inches; light gray (2.5Y 7/2) silty clay loam, light yellowish brown (2.5Y 6/2) moist; massive; hard, firm, sticky and plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 35 to 45 percent

Depth to Bk horizon: 10 to 15 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 moist

Chroma: 2, 3, or 4

Clay content: 30 to 40 percent

Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay loam

Clay content: 32 to 45 percent

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

BC horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 1 or 2

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Gypsum: 1 to 6 percent

Reaction: pH 7.4 to 9.0

Note: Some pedons have a By or Bky horizon.

323C—Sagedale silty clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 2 to 8 percent

Composition

Major Components

Sagedale and similar soils: 85 percent

Minor Components

Daglum and similar soils: 0 to 8 percent

Soils that have slopes more than 8 percent:
0 to 7 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.5 inches

Savage Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landforms: Alluvial fans, stream terraces, or small drainageways

Parent material: Alluvium

Slope range: 0 to 3 percent

Annual precipitation: 13 to 17 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Fine, montmorillonitic Typic Argiborolls

Typical Pedon

Savage silty clay loam, 0 to 3 percent slopes, in a cropland area, 200 feet north and 100 feet east of the southwest corner of sec. 29, T. 37 N., R. 3 W.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium granular structure; hard, friable, sticky and plastic; many very fine and fine roots and pores; neutral; abrupt smooth boundary.

Bt1—5 to 9 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; many very fine and fine roots and tubular pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—9 to 16 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; common very fine and fine roots and pores; common distinct clay films on faces of peds and lining pores; mildly alkaline; clear wavy boundary.

Bk1—16 to 23 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong coarse prismatic structure; very hard, firm, sticky and plastic; common very fine roots and tubular pores and common fine roots; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—23 to 42 inches; light yellowish brown (5Y 6/4) silty clay, olive (5Y 4/3) moist; weak coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots and pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—42 to 60 inches; light yellowish brown (5Y 6/3) silty clay loam, olive (5Y 4/3) moist; massive; very hard, firm, sticky and plastic; few very fine roots and pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 5 to 17 inches

Mollic epipedon thickness: 8 to 16 inches

Content of clay in the control section: 27 to 45 percent

Depth to Bk horizon: 10 to 22 inches

Ap horizon

Hue: 7.5YR, 10YR, or 2.5Y

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 45 percent

Reaction: pH 6.1 to 7.8

Bt horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 3, 4, or 5 dry; 2, 3, or 4 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Reaction: pH 6.1 to 8.4

Note: A Btk horizon 4 to 18 inches thick is allowed.

Bk and BC horizons

Hue: 7.5YR through 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 30 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Note: Some pedons have C and By horizons below a depth of 36 inches.

82B—Savage silty clay loam, 0 to 3 percent slopes

Setting

Landforms: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 3 percent

Composition

Major Components

Savage and similar soils: 85 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.0 inches

Scobey Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landforms: Till plains or hills

Parent material: Glacial till

Slope range: 0 to 15 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Scobey clay loam in an area of Scobey-Kevin clay loams, 0 to 4 percent slopes; in a cropland area, 1,700 feet north and 100 feet west of the southeast corner of sec. 14, T. 31 N., R. 1 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate medium granular structure parting to weak medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

Bt—6 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots and many very fine and common fine pores; many distinct clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Btk—12 to 18 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and pores; few faint clay films on faces of peds; few fine segregated soft masses and seams of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—18 to 30 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots and pores and few fine pores; few fine soft masses and seams of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—30 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark brownish gray (10YR 4/2) moist; massive; hard, firm, sticky and plastic; few fine roots and pores; violently effervescent; moderately alkaline.

Range in Characteristics

Control section: 6 to 18 inches

Mollic epipedon thickness: 7 to 14 inches

Content of clay in the control section: 35 to 45 percent

Depth to Bk horizon: 12 to 25 inches

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam or clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, trace to 10 percent pebbles

Reaction: pH 6.6 to 8.4

Btk and Bk horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 30 to 40 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, trace to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 30 to 40 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, trace to 10 percent pebbles

Calcium carbonate equivalent: 5 to 12 percent

Gypsum: 1 to 6 percent

Reaction: pH 7.4 to 8.4

Note: By or BC horizons are allowed below a depth of 40 inches.

563B—Scobey clay loam, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Composition

Major Components

Scobey, calcareous and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers: 0 to 5 percent

Elloam and similar soils: 0 to 4 percent

Absher and similar soils: 0 to 3 percent
Acel and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

561B—Scobey-Kevin clay loams, 0 to 4 percent slopes

Setting

Landforms: Scobey—till plains; Kevin—till plains
Slope: Scobey—0 to 4 percent; Kevin—0 to 4 percent

Composition

Major Components

Scobey and similar soils: 50 percent
Kevin and similar soils: 40 percent

Minor Components

Kevin clay loam calcareous: 0 to 2 percent
Nishon and similar soils: 0 to 2 percent
Elloam and similar soils: 0 to 2 percent
Absher and similar soils: 0 to 2 percent
Acel and similar soils: 0 to 2 percent

Major Component Description

Scobey

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

561C—Scobey-Kevin clay loams, 4 to 8 percent slopes

Setting

Landforms: Scobey—till plains; Kevin—till plains
Position on landform: Scobey—foot slopes; Kevin—shoulders
Slope: Scobey—4 to 8 percent; Kevin—4 to 8 percent

Composition

Major Components

Scobey and similar soils: 50 percent
Kevin and similar soils: 40 percent

Minor Components

Kevin clay loam calcareous: 0 to 4 percent
Nishon and similar soils: 0 to 2 percent
Elloam and similar soils: 0 to 2 percent
Absher and similar soils: 0 to 2 percent

Major Component Description

Scobey

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

561D—Scobey-Kevin clay loams, 8 to 15 percent slopes

Setting

Landforms: Scobey—hills; Kevin—hills
Position on landform: Scobey—back slopes; Kevin—shoulders
Slope: Scobey—8 to 15 percent; Kevin—8 to 15 percent

Composition

Major Components

Scobey and similar soils: 45 percent

Kevin and similar soils: 40 percent

Minor Components

Kevin clay loam calcareous: 0 to 4 percent

Nishon and similar soils: 0 to 1 percent

Soils that have slopes less than 8 percent: 0 to 4 percent

Elloam and similar soils: 0 to 3 percent

Absher and similar soils: 0 to 3 percent

Major Component Description

Scobey

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.9 inches

Kevin

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.8 inches

Shambo Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans

Parent material: Alluvium

Slope range: 0 to 4 percent

Annual precipitation: 13 to 17 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed Typic Haploborolls

Typical Pedon

Shambo loam, 0 to 4 percent slopes, in a cropland area, 100 feet south and 100 feet east of the northwest corner of sec. 6, T. 37 N, R. 4 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots and pores; neutral; abrupt smooth boundary.

Bw1—6 to 10 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots and pores; mildly alkaline; clear smooth boundary.

Bw2—10 to 15 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots and common fine pores; mildly alkaline; clear smooth boundary.

Bk1—15 to 26 inches; light gray (2.5Y 7/2) loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—26 to 60 inches; light brownish gray (2.5Y 6/2) loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; common fine filaments and soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Mollic epipedon thickness: 7 to 16 inches

Content of clay in the control section: 18 to 30 percent

Depth to Bk horizon: 14 to 20 inches

Ap horizon

Hue: 10YR

Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Reaction: pH 6.6 to 7.3

Bw horizons

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Texture: Loam, silt loam, or clay loam; typically averages 15 to 45 percent fine sand and coarser

Clay content: 18 to 30 percent

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, silty clay loam, or silt loam

Clay content: 18 to 30 percent

Calcium carbonate equivalent: 5 to 20 percent

Reaction: pH 7.4 to 8.4

Note: Some pedons have a C or B_{ck} horizon.**74B—Shambo loam, 0 to 4 percent slopes*****Setting***

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition**Major Components**

Shambo and similar soils: 85 percent

Minor Components

Shambo loam, calcareous: 0 to 8 percent

Daglum and similar soils: 0 to 7 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.2 inches

743A—Shambo-Fairway loams, 0 to 2 percent slopes***Setting***

Landforms: Shambo—alluvial fans; Fairway—flood plains

Slope: Shambo—0 to 2 percent; Fairway—0 to 2 percent

Composition**Major Components**

Shambo and similar soils: 60 percent

Fairway and similar soils: 30 percent

Minor Components

Soils that have slopes more than 2 percent: 0 to 5 percent

Nesda and similar soils: 0 to 5 percent

Major Component Description**Shambo**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.2 inches

Fairway

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Available water capacity: 8.1 inches

Stemple Series*Depth class:* Very deep (greater than 60 inches)*Drainage class:* Well drained*Permeability:* Moderate (0.6 to 2.0 inches/hour)*Landform:* Mountains*Parent material:* Colluvium*Slope range:* 25 to 70 percent*Annual precipitation:* 18 to 22 inches*Annual air temperature:* 38 to 42 degrees F*Frost-free period:* 50 to 70 days**Taxonomic Class:** Loamy-skeletal, mixed Typic Paleoboralfs**Typical Pedon**

Stemple very cobbly loam in an area of Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes; in a woodland area, 1,700 feet 1,200 feet of the southwest corner of sec. 23, T. 37 N., R. 1 E.

O—2 to 0 inches; forest litter of partially decomposed needles, twigs, roots, and forbs; abrupt smooth boundary.

A—0 to 2 inches; dark gray (10YR 4/1) very cobbly loam, black (10YR 2/1) moist; weak fine

subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; 15 percent pebbles and 10 percent cobbles; medium acid; clear smooth boundary.

E1—2 to 8 inches; pale brown (10YR 6/3) very cobbly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure parting to moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots, many very fine pores; 25 percent pebbles and 20 percent cobbles; strongly acid; clear smooth boundary.

E2—8 to 25 inches; very pale brown (10YR 7/3) extremely cobbly loam, brown (10YR 5/3) moist; weak fine subangular blocky structure parting to moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and many very fine pores; 35 percent pebbles and 20 percent cobbles; medium acid; gradual wavy boundary.

E/Bt—25 to 32 inches; about 60 percent pale brown (10YR 7/3) extremely cobbly loam, brown (10YR 5/3) moist (E part); about 40 percent brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist (Bt part); moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and few medium roots, many very fine pores; common faint clay films on ped faces in Bt part; 35 percent pebbles and 25 percent cobbles; medium acid; gradual wavy boundary.

Bt1—32 to 37 inches; light yellowish brown (10YR 6/4) extremely cobbly clay loam, yellowish brown (10YR 4/4) moist; very moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots and many very fine pores; few faint clay films on ped faces; 45 percent pebbles and 25 percent cobbles; slightly acid; gradual wavy boundary.

Bt2—37 to 60 inches; light yellowish brown (10YR 6/4) extremely cobbly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots and many very fine pores; common distinct clay films on ped faces; 40 percent pebbles and 30 percent cobbles; slightly acid.

Range in Characteristics

Control section: 25 to 40 inches

Content of clay in the control section: 27 to 35 percent

Depth to the Bt horizon: 25 to 50 inches

A and E horizons

Hue: 7.5YR through 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Rock fragments: 35 to 60 percent—10 to 20 percent flagstones or cobbles, 25 to 40 percent channers or pebbles

Reaction: pH 5.1 to 6.5

E/Bt horizon

Hue: 7.5YR through 2.5Y

Value: E part—6, 7, or 8 dry and 4, 5, or 6 moist;

B part—5 or 6 dry and 4 or 5 moist

Chroma: E part—2, 3, or 4; B part—4, 5, or 6

Clay content: 15 to 27 percent

Rock fragments: 35 to 80 percent—0 to 10 percent flagstones or cobbles, 35 to 70 percent channers or pebbles

Reaction: pH 5.1 to 6.5

Bt horizons

Hue: 7.5YR through 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 4, 5, or 6

Clay content: 27 to 35 percent

Rock fragments: 60 to 80 percent—10 to 20 percent flagstones or cobbles, 50 to 60 percent channers or pebbles

Reaction: pH 5.6 to 6.5

861F—Stemple, high elevation-Rubble land complex, 25 to 70 percent slopes

Setting

Landform: Mountains

Position on landform: Back slopes

Slope: 25 to 70 percent

Composition

Major Components

Stemple and similar soils: 50 percent

Rubble land: 40 percent

Minor Components

Soils that have slopes less than 25 percent: 0 to 5 percent

Soils that have no coarse fragments: 0 to 5 percent

Major Component Description

Stemple

Surface layer texture: Very cobbly loam

Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Colluvium
 Native plant cover type: Forest land
 Flooding: None
 Available water capacity: 3.6 inches

Rubble land

Definition: Areas with more than 90 percent of the surface covered by stones and boulders, supporting little or no vegetation

862F—Stemple, low elevation-Rubble land complex, 25 to 70 percent slopes

Setting

Landform: Mountains
 Position on landform: Back slopes
 Slope: 25 to 70 percent

Composition

Major Components

Stemple and similar soils: 50 percent
 Rubble land: 40 percent

Minor Components

Soils that have slopes less than 25 percent: 0 to 5 percent
 Soils that have no coarse fragments: 0 to 5 percent

Major Component Description

Stemple

Surface layer texture: Very cobbly loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Colluvium
 Native plant cover type: Forest land
 Flooding: None
 Available water capacity: 3.6 inches

Rubble land

Definition: Areas with more than 90 percent of the surface covered by stones and boulders, supporting little or no vegetation

Sunburst Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)

Landforms: Hills or escarpments
Parent material: Glacial till
Slope range: 8 to 70 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

Typical Pedon

Sunburst clay loam, 8 to 15 percent slopes, in a cropland area, 2,000 feet north and 50 feet east of the southwest corner of sec. 9, T. 29 N., R. 2 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, firm, sticky and plastic; many very fine roots and common fine and very fine discontinuous pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Bk—6 to 20 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; many very fine roots and common fine and very fine pores; common fine rounded soft masses of lime; strongly effervescent; mildly alkaline; gradual wavy boundary.

Bky1—20 to 28 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and few very fine pores; many fine rounded soft masses of lime in seams and faces of peds; common fine soft masses of gypsum; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky2—28 to 60 inches; gray (10YR 6/1) clay, dark gray (10YR 4/1) moist; massive; hard, firm, sticky and plastic; common very fine roots and few very fine pores; many fine rounded soft masses of lime in seams and faces of peds; common fine soft masses of gypsum; violently effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 35 to 50 percent

Ap horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3

Clay content: 27 to 40 percent
Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 2.5Y or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3
Texture: Clay, clay loam, or silty clay loam
Clay content: 35 to 50 percent
Rock fragments: 0 to 15 percent—0 to 5 percent
cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

Bky horizons

Hue: 2.5Y or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3
Texture: Clay, clay loam, or silty clay
Clay content: 35 to 50 percent
Rock fragments: 0 to 15 percent—0 to 5 percent
cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Gypsum: 1 to 3 percent
Reaction: pH 7.9 to 9.0

53D—Sunburst clay loam, 8 to 15 percent slopes***Setting***

Landform: Hills
Slope: 8 to 15 percent

Composition**Major Components**

Sunburst and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers: 0 to 5 percent
Hillon and similar soils: 0 to 5 percent
Kevin and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 8.3 inches

53E—Sunburst clay loam, 15 to 25 percent slopes***Setting***

Landform: Hills
Slope: 15 to 25 percent

Composition**Major Components**

Sunburst and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers: 0 to 5 percent
Hillon and similar soils: 0 to 5 percent
Kevin and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 8.3 inches

53F—Sunburst clay loam, 25 to 70 percent slopes***Setting***

Landform: Hills
Slope: 25 to 70 percent

Composition**Major Components**

Sunburst and similar soils: 85 percent

Minor Components

Hillon and similar soils: 0 to 5 percent
Kevin and similar soils: 0 to 5 percent
Soils that have noncalcareous surface layers: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till

Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.3 inches

Tally Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landforms: Alluvial fans or hills
Parent material: Alluvium or eolian deposits
Slope range: 2 to 15 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Coarse-loamy, mixed Typic
 Haploborolls

Typical Pedon

Tally sandy loam, 2 to 8 percent slopes, in a rangeland area, 60 feet north and 90 feet east of the center of sec. 13, T. 37 N., R. 6 W.

A—0 to 4 inch; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; moderate very fine granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; neutral; abrupt smooth boundary.

Bw—4 to 14 inches; dark brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium angular blocky structure; hard, friable, nonsticky and nonplastic; common fine roots; mildly alkaline; gradual wavy boundary.

Bk1—14 to 23 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic structure; hard, very friable, nonsticky and nonplastic; common fine roots; few soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—23 to 42 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; common fine soft masses of lime and coating sands and pebbles; strongly effervescent; moderately alkaline; diffuse irregular boundary.

2Bk3—42 to 60 inches; light brownish gray (10YR 6/2) loamy fine sand, dark brown (10YR 4/3) moist; massive; loose, nonsticky and nonplastic; few fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Mollic epipedon thickness: 10 to 16 inches
Content of clay in the control section: 5 to 18 percent
Depth to Bk horizon: 15 to 30 inches

A horizon

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 3, 4, or 5 dry; 2, 3, or 4 moist
 Chroma: 2 or 3
 Clay content: 5 to 15 percent
 Reaction: pH 6.1 to 7.8.

Bw horizon

Hue: 7.5YR, 10YR, or 2.5Y
 Value: 4 or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Texture: Fine sandy loam or sandy loam
 Clay content: 5 to 18 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 7.5YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loamy fine sand, loamy sand, fine sand, fine sandy loam, or sandy loam
 Clay content: 5 to 18 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4
Note: The loamy fine sand, loamy sand, and fine sand occur at a depth of more than 20 inches; some pedons have glacial till at depths of 40 to 60 inches.

12C—Tally sandy loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
 Slope: 2 to 8 percent

Composition

Major Components

Tally and similar soils: 85 percent

Minor Components

Blanchard and similar soils: 0 to 8 percent
 Soils that have slopes more than 8 percent: 0 to 7 percent

Major Component Description

Surface layer texture: Sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium or eolian material
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 7.0 inches

12D—Tally sandy loam, 8 to 15 percent slopes

Setting

Landform: Hills
 Slope: 8 to 15 percent

Composition

Major Components

Tally and similar soils: 85 percent

Minor Components

Blanchard and similar soils: 0 to 8 percent
 Soils that have slopes less than 8 percent: 0 to 7 percent

Major Component Description

Surface layer texture: Sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium or eolian material
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 7.0 inches

Tanna Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glacial till deposited over shale
Slope range: 0 to 8 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Tanna clay loam, 0 to 4 percent slopes, in a cropland

area, 1,300 feet south and 2,200 feet west of the northeast corner of sec. 19, T. 34 N., R. 1 W.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots and many very fine and fine pores; 5 percent channers; mildly alkaline; abrupt smooth boundary.

Bt—6 to 15 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong fine and medium prismatic structure parting to strong fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and many very fine and fine pores; many distinct clay films on faces of peds; 2 percent channers; mildly alkaline; clear smooth boundary.

Bk1—15 to 20 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium prismatic structure parting to moderate medium angular blocky structure; slightly hard, friable, sticky and plastic; common very fine roots and common fine roots and pores; common medium filaments and threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—20 to 28 inches; gray (10YR 5/3) clay loam, dark gray (10YR 4/3) moist; weak subangular blocky structure; slightly hard, friable, sticky and plastic; few fine roots and very fine pores; few fine soft masses of lime; 20 percent pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—28 to 60 inches; gray (10YR 5/1) consolidated shale, dark gray (10YR 4/1) moist; neutral.

Range in Characteristics

Control section: 6 to 15 inches
Mollic epipedon thickness: 7 to 12 inches
Content of clay in the control section: 35 to 45 percent
Depth to semiconsolidated bedrock: 20 to 40 inches
Depth to Bk horizon: 11 to 18 inches

Ap horizon

Hue: 10YR or 2.5Y
 Value: 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 27 to 35 percent
 Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 3 or 4 moist
 Chroma: 2 or 3
 Texture: Clay loam, silty clay loam, clay, or silty clay
 Clay content: 35 to 50 percent
 Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: Clay loam, silty clay loam, or clay
 Clay content: 35 to 50 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1, 2, 3, or 4
 Texture: Loam, clay loam, clay, or silty clay loam
 Clay content: 15 to 40 percent
 Rock fragments: 0 to 60 percent—0 to 5 percent cobbles, 10 to 55 percent channers
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0

Note: Some pedons have a Bky horizon with few to common threads of gypsum.

Cr horizon

Material: Semiconsolidated shale with thin layers of hard sandstone that are rippable

13B—Tanna clay loam, 0 to 4 percent slopes**Setting**

Landform: Till plains
 Slope: 0 to 4 percent

Composition**Major Components**

Tanna and similar soils: 85 percent

Minor Components

Neldore and similar soils: 0 to 8 percent
 Tanna clay loam calcareous: 0 to 7 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained

Dominant parent material: Shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 3.8 inches

13C—Tanna clay loam, 4 to 8 percent slopes**Setting**

Landform: Till plains
 Slope: 4 to 8 percent

Composition**Major Components**

Tanna and similar soils: 85 percent

Minor Components

Neldore and similar soils: 0 to 8 percent
 Tanna clay loam calcareous: 0 to 7 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Moderately deep (20 to 40 inches)
 Drainage class: Well drained
 Dominant parent material: Shale residuum
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 3.8 inches

Telstad Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glacial till
Slope range: 0 to 8 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Telstad loam in an area of Telstad-Joplin loams, 0 to 4 percent slopes; in a cropland area, 1,075 feet north and 2,600 feet west of the southeast corner of sec. 35, T. 33 N., R. 1 W.

Ap—0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine granular

structure; slightly hard, friable, slightly sticky and slightly plastic; few medium and fine roots and many very fine pores; neutral; abrupt smooth boundary.

Bt1—5 to 10 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; slightly hard, firm, sticky and plastic; few medium and fine roots and common very fine pores; few faint clay films on faces of peds; neutral; clear wavy boundary.

Bt2—10 to 19 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate coarse and medium subangular blocky structure; hard, firm, sticky and plastic; few fine and very fine roots and common very fine pores; common distinct clay films on faces of peds; slightly effervescent; mildly alkaline; clear wavy boundary.

Bk—19 to 37 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine roots and few very fine pores; few fine filaments and irregularly shaped soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

By—37 to 60 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; few fine irregularly shaped nests of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 5 to 19 inches

Mollic epipedon thickness: 7 to 12 inches

Content of clay in the control section: 25 to 35 percent

Depth to Bk horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 18 to 32 percent

Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 3, 4, or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

By horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Gypsum: 0 to 3 percent

Air dry bulk density: 1.7 or more

Reaction: pH 7.9 to 8.4

50B—Telstad clay loam, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Composition

Major Components

Telstad and similar soils: 85 percent

Minor Components

Elloam and similar soils: 0 to 5 percent

Joplin and similar soils: 0 to 5 percent

Acel and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.8 inches

503B—Telstad-Joplin clay loams, 0 to 4 percent slopes***Setting***

Landforms: Telstad—till plains; Joplin—till plains
Slope: Telstad—0 to 4 percent; Joplin—0 to 4 percent

Composition**Major Components**

Telstad and similar soils: 50 percent
Joplin and similar soils: 40 percent

Minor Components

Elloam and similar soils: 0 to 3 percent
McKenzie and similar soils: 0 to 2 percent
Hillon and similar soils: 0 to 3 percent
Acel and similar soils: 0 to 2 percent

Major Component Description**Telstad**

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

Joplin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.1 inches

503C—Telstad-Joplin clay loams, 4 to 8 percent slopes***Setting***

Landforms: Telstad—till plains; Joplin—till plains
Position on landform: Telstad—foot slopes; Joplin—shoulders
Slope: Telstad—4 to 8 percent; Joplin—4 to 8 percent

Composition**Major Components**

Telstad and similar soils: 45 percent
Joplin and similar soils: 40 percent

Minor Components

Elloam and similar soils: 0 to 7 percent
McKenzie and similar soils: 0 to 2 percent
Hillon and similar soils: 0 to 6 percent

Major Component Description**Telstad**

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.8 inches

Joplin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.1 inches

504B—Telstad-Joplin loams, 0 to 4 percent slopes***Setting***

Landforms: Telstad—till plains; Joplin—till plains
Slope: Telstad—0 to 4 percent; Joplin—0 to 4 percent

Composition**Major Components (fig. 6)**

Telstad and similar soils: 50 percent
Joplin and similar soils: 35 percent

Minor Components

Elloam and similar soils: 0 to 5 percent
McKenzie and similar soils: 0 to 2 percent
Hillon and similar soils: 0 to 5 percent
Acel and similar soils: 0 to 3 percent

Major Component Description**Telstad**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland



Figure 6. Typical area of stripcropping on Telstad-Joplin loams, 0 to 4 percent slopes.

Flooding: None
Available water capacity: 9.9 inches

Joplin

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.2 inches

504C—Telstad-Joplin loams, 4 to 8 percent slopes

Setting

Landforms: Telstad—till plains; Joplin—till plains
Position on landform: Telstad—foot slopes; Joplin—shoulders

Slope: Telstad—4 to 8 percent; Joplin—4 to 8 percent

Composition

Major Components

Telstad and similar soils: 45 percent
Joplin and similar soils: 40 percent

Minor Components

Hillon and similar soils: 0 to 13 percent
McKenzie and similar soils: 0 to 2 percent

Major Component Description

Telstad

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.9 inches

Joplin

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.2 inches

Tinsley Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landforms: Outwash plains, kames, or eskers
Parent material: Glacial outwash
Slope range: 2 to 25 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Typic Ustorthents

Typical Pedon

Tinsley gravelly sandy loam, 8 to 25 percent slopes, in a cropland area, 2,600 feet west and 2,000 feet north of the southeast corner of sec. 23, T. 37 N., R. 2 W.

Ap—0 to 4 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots and common very fine pores; 20 percent pebbles; moderately alkaline; abrupt smooth boundary.

C—4 to 60 inches; brown (10YR 5/3) very gravelly coarse sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; 40 percent pebbles; violently effervescent; strongly alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 0 to 10 percent
Rock fragments in the control section: 35 to 70 percent

Ap horizon

Hue: 10YR or 2.5Y
 Value: 4 or 5 dry; 3 or 4 moist
 Chroma: 2, 3, or 4
 Clay content: 5 to 10 percent
 Rock fragments: 15 to 60 percent—0 to 10

percent stones and cobbles, 15 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

C horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Sand or loamy sand
 Clay content: 0 to 10 percent
 Rock fragments: 35 to 70 percent—5 to 25 percent stones and cobbles, 30 to 45 percent pebbles
 Reaction: pH 6.6 to 8.4.

77C—Tinsley gravelly sandy loam, 2 to 8 percent slopes**Setting**

Landform: Outwash plains
 Slope: 2 to 8 percent

Composition**Major Components**

Tinsley and similar soils: 85 percent

Minor Components

Yetull and similar soils: 0 to 5 percent
 Attewan and similar soils: 0 to 5 percent
 Evanston and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Excessively drained
 Dominant parent material: Glacial outwash
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 1.2 inches

77E—Tinsley gravelly sandy loam, 8 to 25 percent slopes**Setting**

Landforms: Kames and eskers
 Slope: 8 to 25 percent

Composition**Major Components**

Tinsley and similar soils: 85 percent

Minor Components

Busby and similar soils: 0 to 5 percent

Yamac and similar soils: 0 to 5 percent

Soils that have slopes less than 8 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly sandy loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Excessively drained
 Dominant parent material: Glacial outwash
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 1.2 inches

Trudau Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed, frigid Aridic
 Ustochrepts

Typical Pedon

Trudau loam, 0 to 4 percent slopes, in a cropland area, 750 feet north and 1,400 feet west of the southeast corner of sec. 6, T. 34 N., R. 3 W.

Ap—0 to 4 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak thick platy structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots and common fine pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Bw—4 to 12 inches; dark grayish brown (2.5Y 6/2) clay loam, very dark grayish brown (2.5Y 5/2) moist; moderate subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots and pores and few fine roots; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkz1—12 to 25 inches; light grayish brown (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak

coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots and pores; very few fine filaments of lime; very few fine filaments of salt crystals; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkz2—25 to 40 inches; light grayish brown (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; hard, firm, slightly sticky and plastic; few very fine roots and pores; few fine filaments of lime; very few fine filaments of salt crystals; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkz3—40 to 60 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; few very fine roots and pores; common few lime on faces of peds; very few fine filaments of salt crystals; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Content of clay in the control section: 20 to 35 percent
Depth to the Bkz horizon: 10 to 23 inches

Ap horizon
 Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 2 or 3
 Clay content: 20 to 27 percent
 Reaction: pH 8.4 to 9.0

Bw horizon
 Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loam or clay loam
 Clay content: 20 to 35 percent
 Rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium absorption ratio: less than 5
 Reaction: pH 8.4 to 9.0

Bkz horizons
 Hue: 10YR or 2.5Y
 Value: 6, 7, or 8 dry; 5, 6, or 7 moist
 Chroma: 2, 3, or 4
 Texture: Mainly loam stratified with sandy loam, silt loam, or clay loam
 Clay content: 18 to 27 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium absorption ratio: 2 to 13
 Reaction: pH 8.4 to 9.0

54B—Trudau loam, 0 to 4 percent slopes**Setting**

Landform: Alluvial fans
Slope: 0 to 4 percent

Composition**Major Components**

Trudau and similar soils: 85 percent

Minor Components

Yamac and similar soils: 0 to 5 percent
Marvan and similar soils: 0 to 5 percent
Vanda and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: 6.0 inches

Turner Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour) to 21 inches; rapid below this depth (6.0 to 20.0 inches/hour)
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 0 to 6 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls

Typical Pedon

Turner loam, 0 to 4 percent slopes, in a cropland area, 50 feet south and 3,200 feet east of the northwest corner of sec. 5, T. 35 N., R. 4 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic;

many very fine and fine roots and common fine pores; 5 percent pebbles; neutral; abrupt smooth boundary.

Bt—5 to 10 inches; brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; common faint clay films on faces of peds and lining tubular pores; 5 percent pebbles; neutral; gradual wavy boundary.

Btk—10 to 15 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky structure; hard, firm, sticky and plastic; few faint clay films on faces of peds and lining tubular pores; 5 percent pebbles; few fine soft masses of lime; strongly effervescent; mildly alkaline; gradual wavy boundary.

Bk—15 to 21 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; 10 percent pebbles; many medium soft masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2C—21 to 60 inches; grayish brown (2.5Y 5/2) very gravelly loamy sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; 40 percent pebbles and 10 percent cobbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 5 to 40 inches
Mollic epipedon thickness: 7 to 15 inches
Depth to Bk horizon: 11 to 20 inches
Depth to 2C horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 7.5YR
Value: 2 or 3 moist
Chroma: 2 or 3
Texture: Loam or sandy loam
Clay content: 15 to 25 percent
Reaction: pH 6.1 to 7.8

Bt and Btk horizons

Hue: 7.5YR, 10YR, or 2.5Y
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 2 or 3
Texture: Clay loam, sandy clay loam, or loam
Clay content: 25 to 35 percent

Rock fragments: 0 to 30 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles
Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 7.5YR, 10YR, or 2.5Y
Value: 5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist
Chroma: 2 or 3
Texture: Loam or clay loam
Clay content: 25 to 35 percent
Rock fragments: 0 to 30 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

2C horizon

Hue: 2.5Y or 10YR
Chroma: 2, 3, or 4
Texture: Loamy sand or sand
Clay content: 0 to 5 percent
Rock fragments: 35 to 80 percent—5 to 20 percent cobbles, 30 to 60 percent pebbles
Reaction: pH 7.4 to 8.4

51B—Turner loam, 0 to 4 percent slopes**Setting**

Landform: Relict stream terraces
Slope: 0 to 4 percent

Composition**Major Components**

Turner and similar soils: 85 percent

Minor Components

Turner loam calcareous: 0 to 5 percent
Farnuf and similar soils: 0 to 5 percent
Soils that have slopes more than 4 percent:
0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 4.6 inches

511C—Turner sandy loam, 2 to 6 percent slopes**Setting**

Landform: Relict stream terraces
Slope: 2 to 6 percent

Composition**Major Components**

Turner and similar soils: 85 percent

Minor Components

Tinsley and similar soils: 0 to 8 percent
Farnuf and similar soils: 0 to 7 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 4.4 inches

Vaeda Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (less than 0.06 inch/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, nonacid, frigid Aridic Ustorthents

Typical Pedon

Vaeda silty clay loam, 0 to 2 percent slopes, in a rangeland area, 2,600 feet south and 600 feet west of the northeast corner of sec. 17, T. 32 N., R. 2 W.

E—0 to 2 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; very hard, friable, slightly sticky and slightly plastic; many very fine roots and common very fine pores; medium acid; abrupt smooth boundary.

Bnz—2 to 13 inches; gray (10YR 6/2) silty clay, very dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots and common fine roots and pores; many fine soft masses of salt crystals; medium acid; clear smooth boundary.

Bnyz1—13 to 28 inches; gray (10YR 6/1) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few fine roots and pores; common fine soft masses and seams of gypsum and other salts; slightly acid; clear smooth boundary.

Bnyz2—28 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, dark gray (10YR 4/1) moist; massive; hard, firm, sticky and plastic; few very fine roots and few fine roots and pores; few fine soft masses and seams of gypsum and other salts; slightly acid.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 35 to 60 percent

Depth to the Bnyz horizon: 10 to 15 inches

E horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2 or 3

Clay content: 35 to 40 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 5.6 to 7.8

Note: Some pedons may have an A horizon that is 1/2- to 1-inch thick.

Bnz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 60 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 10 to 20

Reaction: pH 5.1 to 7.8

Note: Some pedons have a Bw horizon 3 to 6 inches thick.

Bnyz horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Silty clay loam, silty clay, or clay
Clay content: 35 to 60 percent
Electrical conductivity: 4 to 16 mmhos/cm
Sodium adsorption ratio: 10 to 20
Gypsum: 1 to 5 percent
Reaction: pH 6.1 to 8.4

62A—Vaeda silty clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 2 percent

Composition

Major Components

Vaeda and similar soils: 90 percent

Minor Components

Creed and similar soils: 0 to 5 percent

Marias and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 6.4 inches

Vanda Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (less than 0.06 inch/hour)

Landform: Alluvial fans

Parent material: Alluvium

Slope range: 0 to 8 percent

Annual precipitation: 10 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

Typical Pedon

Vanda silty clay, 0 to 4 percent slopes, in a rangeland area, 700 feet north and 1,300 feet west of the southeast corner of sec. 22, T. 34 N., R. 2 W.

E—0 to 1 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate very thin platy structure; soft, very friable, sticky and plastic; common very fine and fine roots and many very fine and fine pores; moderately alkaline; abrupt smooth boundary.

Bk—1 to 9 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine prismatic structure parting to moderate medium blocky structure; hard, firm, very sticky and plastic; many very fine and fine roots and pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bknyz—9 to 18 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine angular blocky structure; very hard, very firm, very sticky and plastic; few very fine roots and common very fine pores; common fine irregularly shaped soft masses of lime; common fine soft masses and seams of gypsum and other salts; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bnyz1—18 to 52 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky and plastic; few very fine roots and common very fine pores; common medium irregularly shaped soft masses of gypsum and other salts; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bnyz2—52 to 60 inches; dark grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky and plastic; few very fine roots and pores; many medium and coarse irregularly shaped soft masses of gypsum and other salts; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 35 to 60 percent

Depth to the Bknyz horizon: 7 to 24 inches

E horizon

Hue: 2.5Y or 5Y

Value: 5, 6, or 7 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Hardness: Very hard, extremely hard, or massive crusts

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 1 to 30

Reaction: pH 7.8 to 9.6

Note: In some pedons the upper 6 inches of soil is noncalcareous unless mixed.

Bk horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Hardness: Very hard or extremely hard

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 30

Reaction: pH 7.8 to 9.6

Bknyz and Bnyz horizons

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Hardness: Very hard or extremely hard

Gypsum: 1 to 5 percent with total gypsum less than 150

Electrical conductivity: 8 to 16 mmhos/cm

Sodium absorption ratio: 13 to 30

Gypsum: 1 to 5 percent

Reaction: pH 7.8 to 9.6

48B—Vanda silty clay, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition

Major Components

Vanda and similar soils: 85 percent

Minor Components

Benz and similar soils: 0 to 5 percent

Marvan and similar soils: 0 to 5 percent

Creed and similar soils: 0 to 3 percent

Gerdrum and similar soils: 0 to 2 percent

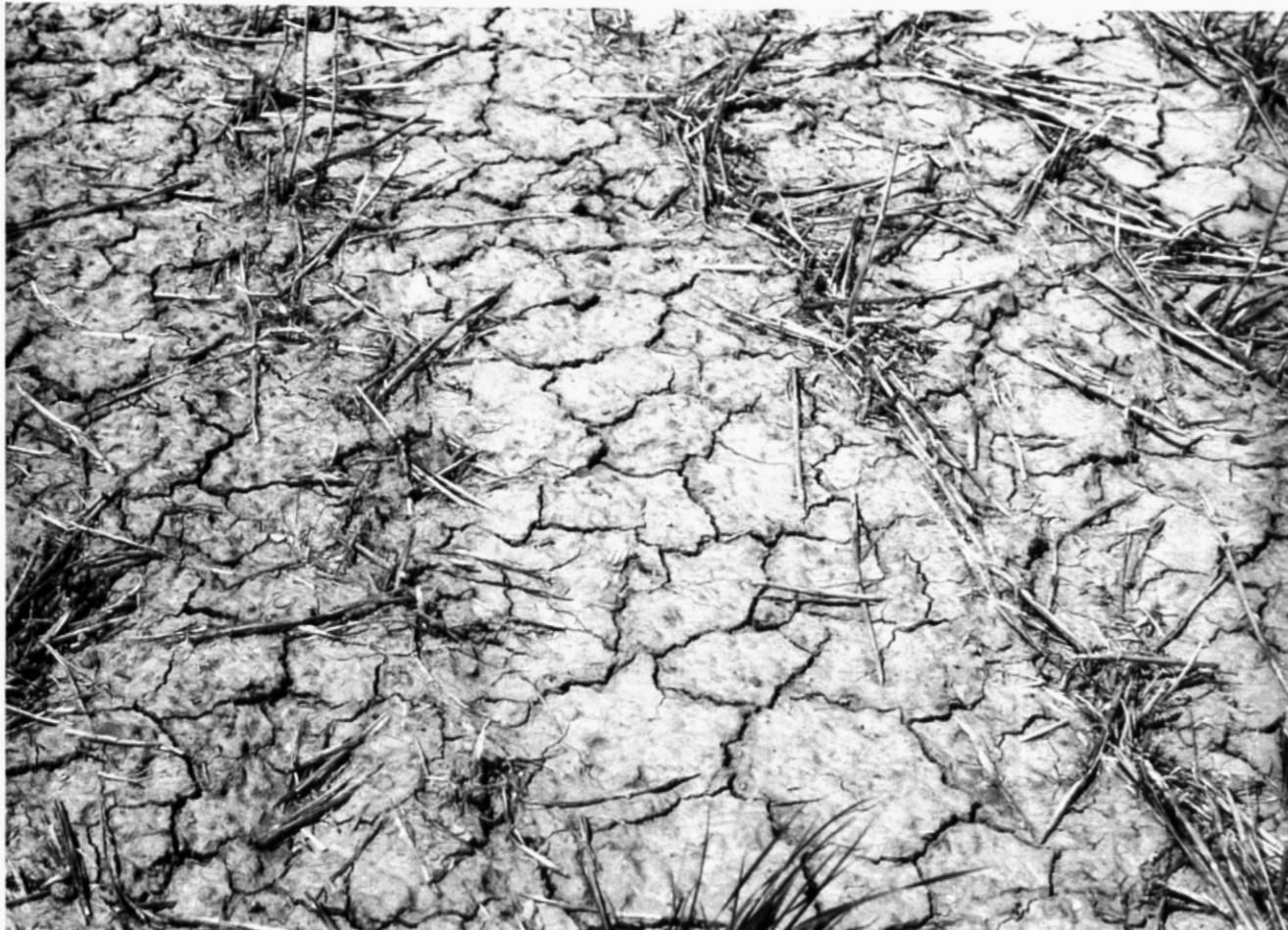


Figure 7. Cracks and surface crusting on a typical area of Vanda silty clay, 0 to 4 percent slopes.

Major Component Description

Surface layer texture: Silty clay (fig. 7)
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 6.0 inches

48C—Vanda silty clay, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
 Slope: 4 to 8 percent

Composition

Major Components

Vanda and similar soils: 85 percent

Minor Components

Benz and similar soils: 0 to 5 percent
 Marvan and similar soils: 0 to 5 percent
 Creed and similar soils: 0 to 3 percent
 Gerdrum and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 6.0 inches

482A—Vanda-Marvan, saline, clays, 0 to 2 percent slopes

Setting

Landforms: Vanda—alluvial fans; Marvan—alluvial fans (fig. 8)

Slope: Vanda—0 to 2 percent; Marvan—0 to 2 percent

Composition

Major Components

Vanda and similar soils: 50 percent

Marvan and similar soils: 35 percent

Minor Components

Marias and similar soils: 0 to 5 percent

Soils that have slopes more than 2 percent: 0 to 5 percent

Marvan, nonsaline: 0 to 5 percent

Major Component Description

Vanda

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: 6.0 inches

Marvan

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None



Figure 8. Typical area of Vanda-Marvan, saline clays, 0 to 2 percent slopes. The Vanda soil occupies the less vegetated microlow positions and the Marvan, saline soil occupies the better vegetated microhighs.

Salt affected: Saline within 30 inches
 Sodium affected: Sodic within 30 inches
 Available water capacity: 6.7 inches

Vida Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landforms: Till plains or hills
Parent material: Glacial till
Slope range: 0 to 15 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed Typic
 Argiborolls

Typical Pedon

Vida clay loam, 2 to 8 percent slopes, in a cropland area, 100 feet south and 400 feet east of the northwest corner of sec. 7, T. 37 N., R. 2 W.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; many fine roots and pores; mildly alkaline; abrupt smooth boundary.

Bt—4 to 9 inches; brown (10YR 4/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine angular blocky structure; hard, firm, sticky and plastic; common fine and medium roots and pores; common faint clay films on faces of peds and lining pores; mildly alkaline; clear wavy boundary.

Bk—9 to 30 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parting to moderate medium and fine subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots and pores; many large irregularly shaped masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—30 to 60 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist, massive; hard, firm, sticky and plastic; few fine and medium roots and pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 4 to 40 inches
Mollic epipedon thickness: 7 to 10 inches

Content of clay in the control section: 27 to 35 percent
Depth to Bk horizon: 6 to 10 inches

Ap horizon

Value: 3 or 4 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 27 to 35 percent
 Reaction: pH 6.6 to 8.4

Bt horizon

Hue: 10YR
 Value: 4 or 5 dry; 3 or 4 moist
 Chroma: 2 or 3
 Texture: Loam, clay loam, or clay
 Clay content: 25 to 45 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
 Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 5 or 6 moist
 Chroma: 2 or 3
 Texture: Loam or clay loam
 Clay content: 25 to 35 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loam or clay loam
 Clay content: 25 to 35 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
 Calcium carbonate equivalent: 2 to 12 percent
 Gypsum: 0 to 5 percent
 Reaction: pH 7.9 to 8.4

69A—Vida clay loam, 0 to 2 percent slopes

Setting

Landform: Till plains
 Slope: 0 to 2 percent

Composition

Major Components

Vida and similar soils: 85 percent

Minor Components

Vida clay loam calcareous: 0 to 5 percent
 Nishon and similar soils: 0 to 2 percent
 Daglum and similar soils: 0 to 5 percent
 Soils that have slopes more than 2 percent:
 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

69C—Vida clay loam, 2 to 8 percent slopes**Setting**

Landform: Till plains
 Slope: 2 to 8 percent

Composition**Major Components**

Vida and similar soils: 85 percent

Minor Components

Vida clay loam calcareous: 0 to 5 percent
 Nishon and similar soils: 0 to 2 percent
 Daglum and similar soils: 0 to 5 percent
 Soils that have slopes more than 8 percent:
 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

692D—Vida, calcareous-Williams-Zahill clay loams, 4 to 15 percent slopes**Setting**

Landforms: Vida, calcareous—hills; Williams—hills;
 Zahill—hills

Position on landform: Vida, calcareous—back slopes; Williams—foot slopes; Zahill—shoulders
 Slope: Vida, calcareous—4 to 8 percent; Williams—4 to 8 percent; Zahill—8 to 15 percent

Composition**Major Components**

Vida, calcareous and similar soils: 45 percent
 Williams and similar soils: 20 percent
 Zahill and similar soils: 20 percent

Minor Components

Soils that have slopes more than 15 percent:
 0 to 13 percent
 Nishon and similar soils: 0 to 2 percent

Major Component Description**Vida, calcareous**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Williams

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.4 inches

Zahill

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

697C—Vida-Bearpaw clay loams, 2 to 8 percent slopes**Setting**

Landforms: Vida—till plains; Bearpaw—till plains

Position on landform: Vida—back slopes;
 Bearpaw—foot slopes
 Slope: Vida—2 to 8 percent; Bearpaw—2 to
 8 percent

Composition

Major Components

Vida and similar soils: 50 percent
 Bearpaw and similar soils: 35 percent

Minor Components

Daglum and similar soils: 0 to 7 percent
 Nishon and similar soils: 0 to 2 percent
 Soils that have slopes more than 8 percent:
 0 to 6 percent

Major Component Description

Vida

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Bearpaw

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.7 inches

698D—Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes

Setting

Landforms: Vida—hills; Bearpaw—till plains; Nishon—
 closed depressions
 Position on landform: Vida—shoulders;
 Bearpaw—back slopes;
 Slope: Vida—4 to 15 percent; Bearpaw—0 to 8
 percent; Nishon—0 to 1 percent

Composition

Major Components

Vida and similar soils: 35 percent
 Bearpaw and similar soils: 30 percent
 Nishon and similar soils: 25 percent

Minor Components

Tinsley and similar soils: 0 to 4 percent
 Vida gravelly clay loam: 0 to 3 percent
 Soils that have slopes more than 15 percent:
 0 to 3 percent

Major Component Description

Vida

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Bearpaw

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.7 inches

Nishon

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Poorly drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Ponding: Long
 Available water capacity: 9.3 inches

691B—Vida-Vida, calcareous-Williams clay loams, 0 to 3 percent slopes

Setting

Landforms: Vida—till plains; Vida, calcareous—till
 plains; Williams—till plains
 Slope: Vida—0 to 3 percent; Vida, calcareous—0 to 3
 percent; Williams—0 to 3 percent

Composition

Major Components

Vida and similar soils: 40 percent
 Vida, calcareous and similar soils: 25 percent
 Williams and similar soils: 20 percent

Minor Components

Zahill and similar soils: 0 to 7 percent
 Nishon and similar soils: 0 to 2 percent
 Soils that have slopes more than 3 percent:
 0 to 6 percent

Major Component Description**Vida**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Vida, calcareous

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Williams

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.4 inches

691C—Vida-Vida, calcareous-Williams clay loams, 3 to 8 percent slopes***Setting***

Landforms: Vida—till plains; Vida, calcareous—till plains; Williams—till plains
 Position on landform: Vida—back slopes; Vida, calcareous—shoulders; Williams—foot slopes
 Slope: Vida—3 to 8 percent; Vida, calcareous—3 to 8 percent; Williams—3 to 8 percent

Composition**Major Components**

Vida and similar soils: 35 percent
 Vida, calcareous and similar soils: 30 percent
 Williams and similar soils: 20 percent

Minor Components

Zahill and similar soils: 0 to 7 percent
 Nishon and similar soils: 0 to 2 percent
 Soils that have slopes more than 8 percent:
 0 to 6 percent

Major Component Description**Vida**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Vida, calcareous

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Williams

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.4 inches

694C—Vida-Williams clay loams, 3 to 8 percent slopes***Setting***

Landforms: Vida—till plains; Williams—till plains
 Position on landform: Vida—back slopes; Williams—foot slopes
 Slope: Vida—3 to 8 percent; Williams—3 to 8 percent

Composition**Major Components**

Vida and similar soils: 50 percent
 Williams and similar soils: 35 percent

Minor Components

Soils that have slopes more than 8 percent:
 0 to 7 percent
 Nishon and similar soils: 0 to 2 percent
 Soils that have slopes less than 3 percent:
 0 to 6 percent

Major Component Description**Vida**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Williams

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.4 inches

**695D—Vida-Williams-Zahill clay loams,
4 to 15 percent slopes*****Setting***

Landforms: Vida—hills; Williams—hills; Zahill—hills
 Position on landform: Vida—back slopes; Williams—foot slopes; Zahill—shoulders
 Slope: Vida—4 to 8 percent; Williams—4 to 8 percent; Zahill—8 to 15 percent

Composition**Major Components**

Vida and similar soils: 35 percent
 Williams and similar soils: 30 percent
 Zahill and similar soils: 20 percent

Minor Components

Soils that have slopes more than 15 percent:
 0 to 13 percent
 Nishon and similar soils: 0 to 2 percent

Major Component Description**Vida**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Williams

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.4 inches

Zahill

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

**696E—Vida-Zahill clay loams, 8 to 25
percent slopes*****Setting***

Landforms: Vida—hills; Zahill—hills
 Position on landform: Vida—back slopes; Zahill—shoulders
 Slope: Vida—8 to 15 percent; Zahill—15 to 25 percent

Composition**Major Components**

Vida and similar soils: 50 percent
 Zahill and similar soils: 35 percent

Minor Components

Soils that have slopes less than 8 percent:
 0 to 8 percent
 Reeder and similar soils: 0 to 7 percent

Major Component Description**Vida**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Zahill

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

698E—Vida-Zahill-Nishon clay loams, 0 to 25 percent slopes

Setting

Landforms: Vida—hills; Zahill—hills; Nishon—closed depressions
 Position on landform: Vida—foot slopes; Zahill—shoulders
 Slope: Vida—0 to 15 percent; Zahill—15 to 25 percent; Nishon—0 to 1 percent

Composition

Major Components

Vida and similar soils: 35 percent
 Zahill and similar soils: 30 percent
 Nishon and similar soils: 25 percent

Minor Components

Tinsley and similar soils: 0 to 4 percent
 Soils that have slopes more than 25 percent: 0 to 3 percent
 Vida gravelly clay loam: 0 to 3 percent

Major Component Description

Vida

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Zahill

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Nishon

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Poorly drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Ponding: Long
 Available water capacity: 9.3 inches

W—Water

Composition

Major Components

Water: 100 percent

Major Component Description

Definition: Areas of open water

Whitlash Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Mountains
Parent material: Colluvium
Slope range: 8 to 70 percent
Annual precipitation: 18 to 22 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 70 to 105 days

Taxonomic Class: Loamy-skeletal, mixed Lithic Haploborolls

Typical Pedon

Whitlash cobbly loam in an area of Perma-Whitlash cobbly loams, 8 to 25 percent slopes; in a rangeland area, 2,200 feet south and 100 feet west of the northeast corner of sec. 18, T. 36 N., R. 3 E.

A—0 to 9 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 20 percent cobbles and 15 percent pebbles; neutral; clear smooth boundary.

- Bw—9 to 19 inches; grayish brown (10YR 5/2) extremely cobbly loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; 50 percent cobbles and 25 percent pebbles; neutral; gradual smooth boundary.
- R—19 to 60 inches; hard, fractured igneous bedrock.

Range in Characteristics

Control section: 10 to 19 inches
Mollic epipedon thickness: 7 to 15 inches
Content of clay in the control section: 10 to 27 percent
Depth to bedrock: 10 to 20 inches

A horizon

Value: 3 or 4 dry; 2 or 3 moist
 Chroma: 1, 2, or 3
 Clay content: 10 to 27 percent, less than 35 percent fine and coarser sand
 Rock fragments: 15 to 35 percent—5 to 15 percent pebbles and channers, 10 to 30 percent cobbles, flagstones, and stones
 Reaction: pH 6.1 to 7.3

Bw horizon

Value: 4 or 5 dry; 3 or 4 moist
 Chroma: 2 or 3
 Texture: Loam, sandy clay loam, or sandy loam
 Clay content: 10 to 27 percent, less than 35 percent fine and coarser sand
 Rock fragments: 35 to 80 percent—15 to 60 percent pebbles and channers, 5 to 50 percent cobbles, flagstones, and stones
 Reaction: pH 6.1 to 7.3

Note: Some pedons have a C horizon.

Williams Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landforms: Till plains or hills
Parent material: Glacial till
Slope range: 0 to 8 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Williams clay loam, 0 to 3 percent slopes, in a

cropland area, 1,000 feet south and 2,400 feet west of the northeast corner of sec. 23, T. 37 N., R. 1 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist, moderate fine and medium subangular blocky structure parting to weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and pores; neutral; abrupt smooth boundary.

Bt1—5 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and common very fine and fine pores; common faint clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bt2—8 to 13 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bk—13 to 18 inches; light grayish brown (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and few very fine and fine pores; common soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C—18 to 60 inches; light grayish brown (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 5 to 13 inches
Mollic epipedon thickness: 7 to 15 inches
Content of clay in the control section: 22 to 35 percent
Depth to Bk horizon: 10 to 30 inches

Ap horizon

Hue: 10YR
 Value: 3, 4, or 5 dry; 2 or 3 moist
 Chroma: 2 (some pedons in native grassland have a moist chroma of less than 1.5 in the upper 1 to 3 inches)
 Clay content: 27 to 35 percent
 Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 10YR or 2.5Y

Value: 4, 5, or 6 dry; 2, 3, 4, or 5 moist
 Chroma: 2, 3, or 4
 Texture: Loam or clay loam
 Clay content: 22 to 35 percent clay
 Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loam or clay loam
 Clay content: 22 to 35 percent
 Reaction: pH 7.9 to 8.4
Note: Some pedons have a BC or BCk horizon.

C horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: Loam or clay loam
 Clay content: 22 to 35 percent
 Reaction: pH 7.9 to 8.4

80B—Williams clay loam, 0 to 3 percent slopes

Setting

Landform: Till plains
 Slope: 0 to 3 percent

Composition

Major Components

Williams and similar soils: 85 percent

Minor Components

Daglum and similar soils: 0 to 5 percent
 Nishon and similar soils: 0 to 2 percent
 Vida and similar soils: 0 to 4 percent
 Soils that have slopes more than 3 percent:
 0 to 4 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.4 inches

80C—Williams clay loam, 3 to 8 percent slopes

Setting

Landform: Till plains
 Slope: 3 to 8 percent

Composition

Major Components

Williams and similar soils: 85 percent

Minor Components

Daglum and similar soils: 0 to 5 percent
 Nishon and similar soils: 0 to 2 percent
 Vida and similar soils: 0 to 4 percent
 Soils that have slopes more than 8 percent:
 0 to 4 percent

Major Component Description

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 10.4 inches

Yamacall Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed, frigid Aridic Ustochrepts

Typical Pedon

Yamacall loam, 0 to 4 percent slopes, in a cropland area, 1,500 feet south and 2,200 feet west of the northeast corner of sec. 27, T. 33 N., R. 3 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; medium very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very

fine and fine roots and many very fine continuous pores; moderately alkaline; clear smooth boundary.

Bw—6 to 13 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and continuous pores; moderately alkaline; clear smooth boundary.

Bk1—13 to 18 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine roots and common very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—18 to 35 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure; slightly hard, friable, nonsticky and slightly plastic; many fine roots and common very fine pores; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

C—35 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, nonsticky and slightly plastic; common very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 18 to 30 percent

Depth to the Bk horizon: 10 to 20 inches

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 3, 4, or 5 moist

Chroma: 2, 3, or 4

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

Note: This horizon when mixed to 7 inches will not meet the requirements for a mollic epipedon.

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silt loam

Clay content: 18 to 35 percent, 15 to 35 percent fine sand and coarser

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, clay loam, or silt loam

Clay content: 18 to 35 percent, 15 to 35 percent fine sand and coarser

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, or 7 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam, sandy loam, clay loam, or

silt loam; in some pedons below a depth

of 40 inches the material consists of strata of loam, silt loam, sandy loam, or loamy sand

Clay content: 10 to 30 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

79B—Yamacall loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Yamac loam calcareous: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

Soils that have slopes more than 4 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 8.3 inches

79C—Yamacall loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent

Composition

Major Components

Yamacall and similar soils: 90 percent

Minor Components

Yamac loam calcareous: 0 to 4 percent
Yetull and similar soils: 0 to 3 percent
Soils that have slopes more than 8 percent:
0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 8.3 inches

79D—Yamacall loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Yamacall loam, calcareous: 0 to 5 percent
Delpoint and similar soils: 0 to 5 percent
Soils that have slopes more than 15 percent:
0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland

Flooding: None
Available water capacity: 8.3 inches

793B—Yamacall loam, calcareous, 0 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 4 percent

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers:
0 to 5 percent
Trudau and similar soils: 0 to 5 percent
Soils that have slopes more than 4 percent:
0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 9.7 inches

793C—Yamacall loam, calcareous, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers:
0 to 5 percent
Trudau and similar soils: 0 to 5 percent
Soils that have slopes more than 8 percent:
0 to 5 percent

Major Component Description

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.7 inches

793D—Yamacall loam, calcareous, 8 to 15 percent slopes**Setting**

Landform: Alluvial fans
 Slope: 8 to 15 percent

Composition**Major Components**

Yamacall and similar soils: 85 percent

Minor Components

Soils that have noncalcareous surface layers:
 0 to 5 percent
 Delpoint and similar soils: 0 to 5 percent
 Soils that have slopes more than 15 percent:
 0 to 5 percent

Major Component Description

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Alluvium
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.7 inches

Yetull Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Dunes
Parent material: Eolian deposits
Slope range: 0 to 15 percent
Annual precipitation: 10 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Mixed, frigid Ustic Torripsamments

Typical Pedon

Yetull loamy fine sand, 0 to 15 percent slopes, in a rangeland area, 1,800 feet south and 200 feet west of the northeast corner of sec. 10, T. 31 N., R. 4 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; mildly alkaline; abrupt smooth boundary.

C1—4 to 8 inches; light brownish gray (10YR 6/2) sand, brown (10YR 5/3) moist; single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; strongly effervescent; mildly alkaline; clear smooth boundary.

C2—8 to 20 inches; brown (10YR 5/3) loamy sand, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; violently effervescent; moderately alkaline; gradual smooth boundary.

C3—20 to 60 inches; brown (10YR 5/3) sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few very fine and fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 0 to 10 percent

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 3 or 4 moist
 Chroma: 2, 3, or 4
 Clay content: 0 to 10 percent
 Reaction: pH 6.6 to 7.8

C horizons

Hue: 10YR or 2.5Y
 Value: 4, 5, or 6 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: Sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or coarse sand
 Clay content: 0 to 10 percent
 Reaction: pH 7.4 to 8.4

Note: Finer textured material below depths of 40 inches is allowed.

73D—Yetull loamy fine sand, 0 to 15 percent slopes

Setting

Landform: Sand dunes
Slope: 0 to 15 percent

Composition

Major Components

Yetull and similar soils: 85 percent

Minor Components

Yetull sandy loam: 0 to 8 percent
Lihen and similar soils: 0 to 7 percent

Major Component Description

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: 3.6 inches

Zahill Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landforms: Hills or large drainageways
Parent material: Glacial till
Slope range: 8 to 65 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Typic Ustorthents

Typical Pedon

Zahill clay loam in an area of Vida-Williams-Zahill clay loams, 4 to 15 percent slopes; in a rangeland area, 1,800 feet north and 100 feet west of the southeast corner of sec. 5, T. 37 N., R. 2 W.

A—0 to 5 inches; light gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, sticky and plastic; many very fine and fine roots and pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Bk—5 to 20 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak

medium prismatic structure parting to weak fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and pores; few fine soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

C—20 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Control section: 10 to 40 inches

Content of clay in the control section: 20 to 35 percent

A horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: Loam or clay loam
Clay content: 20 to 35 percent
Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: Loam or clay loam
Clay content: 25 to 35 percent
Rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles, 0 to 10 percent pebbles
Calcium carbonate equivalent: 8 to 15 percent
Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2, 3, or 4
Texture: Loam or clay loam
Clay content: 20 to 35 percent
Rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles, 0 to 10 percent pebbles
Gypsum: 1 to 5 percent
Reaction: pH 7.4 to 9.0

72F—Zahill loam, 25 to 45 percent slopes

Setting

Landform: Hills
Slope: 25 to 45 percent

Composition**Major Components**

Zahill and similar soils: 85 percent

Minor Components

Zahl and similar soils: 0 to 5 percent

Cabba and similar soils: 0 to 4 percent

Doney and similar soils: 0 to 3 percent

Dast and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.7 inches

722F—Zahill-Dast-Cabba complex, 25 to 65 percent slopes**Setting**

Landforms: Zahill—hills; Dast—hills; Cabba—hills

Position on landform: Zahill—shoulders; Dast—foot slopes; Cabba—back slopes

Slope: Zahill—45 to 65 percent; Dast—25 to 45 percent; Cabba—25 to 45 percent

Composition**Major Components**

Zahill and similar soils: 35 percent

Dast and similar soils: 30 percent

Cabba and similar soils: 20 percent

Minor Components

Soils that have slopes less than 25 percent:
0 to 10 percent

Rock outcrop: 0 to 5 percent

Major Component Description**Zahill**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

Dast

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 3.8 inches

Cabba

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 2.3 inches

721E—Zahill-Zahl complex, 15 to 25 percent slopes**Setting**

Landforms: Zahill—hills; Zahl—hills

Position on landform: Zahill—shoulders; Zahl—back slopes

Slope: Zahill—15 to 25 percent; Zahl—15 to 25 percent

Composition**Major Components**

Zahill and similar soils: 60 percent

Zahl and similar soils: 25 percent

Minor Components

Cabba and similar soils: 0 to 5 percent

Doney and similar soils: 0 to 5 percent

Dast and similar soils: 0 to 5 percent

Major Component Description**Zahill**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: 9.6 inches

Zahl

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.5 inches

721F—Zahill-Zahl complex, 25 to 60 percent slopes**Setting**

Landforms: Zahill—hills; Zahl—hills
 Position on landform: Zahill—shoulders; Zahl—back slopes
 Slope: Zahill—45 to 60 percent; Zahl—25 to 45 percent

Composition**Major Components**

Zahill and similar soils: 60 percent
 Zahl and similar soils: 25 percent

Minor Components

Soils that have slopes less than 25 percent: 0 to 5 percent
 Cabba and similar soils: 0 to 4 percent
 Doney and similar soils: 0 to 3 percent
 Dast and similar soils: 0 to 3 percent

Major Component Description**Zahill**

Surface layer texture: Clay loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 9.6 inches

Zahl

Surface layer texture: Loam
 Depth class: Very deep (more than 60 inches)
 Drainage class: Well drained
 Dominant parent material: Till
 Native plant cover type: Rangeland
 Flooding: None
 Available water capacity: 8.5 inches

Zahl Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landforms: Hills or large drainageways
Parent material: Glacial till
Slope range: 15 to 60 percent
Annual precipitation: 13 to 17 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 105 days

Taxonomic Class: Fine-loamy, mixed Typic Calciborolls

Typical Pedon

Zahl loam in an area of Zahill-Zahl complex, 25 to 60 percent slopes; in a rangeland area, 1,900 feet south and 2,100 feet west of the northeast corner of sec. 20, T. 37 N., R. 1 E.

- A1—0 to 4 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak fine granular structure; soft, friable, sticky and plastic; many very fine and fine roots and pores; mildly alkaline; clear wavy boundary.
- A2—4 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark gray (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and pores; mildly alkaline; clear wavy boundary.
- Bk—8 to 17 inches; gray (2.5Y 6/2) clay loam, dark gray (2.5Y 4/2) moist; massive; slightly hard, firm, sticky and plastic; many very fine and fine roots and pores; common fine and medium soft masses of lime; strongly effervescent; mildly alkaline; clear smooth boundary.
- C—17 to 60 inches; gray (2.5Y 5/2) clay loam, dark gray (2.5Y 4/2) moist; massive; slightly hard, firm, sticky and plastic; common very fine and fine roots and pores; strongly effervescent; mildly alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Mollic epipedon thickness: 7 to 16 inches
Content of clay in the control section: 20 to 30 percent
Depth to Bk horizon: 5 to 17 inches

A horizons

Hue: 10YR or 2.5Y
 Value: 3, 4, or 5 dry; 2 or 3 moist
 Chroma: 2 (some pedons have a thin A horizon with a chroma of 1)

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

Note: Some pedons have an AB horizon.

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 3, 4, 5, 6, or 7 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Reaction: pH 7.4 to 8.4

Note: Relict mottles in some pedons; some pedons have a BCK horizon.

C horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist

Chroma: 2, 3, or 4

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Reaction: pH 7.4 to 8.4

Note: Does not have relict mottles in some pedons; some pedons have thin layers of gravel or gravelly sandy loam; some pedons have shale bedrock below a depth of 40 inches.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low 0 to 3.75

Low 3.75 to 5.0

Moderate 5.0 to 7.5

High more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour,

supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board one foot wide, one foot long, and one inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep or very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be

supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Cirque. A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting.

Reproduction is achieved artificially or by natural seeding from adjacent stands.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse grained, clastic rock composed of rounded to subangular rock

fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion; in areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very

hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water.

The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming).

Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of mean annual increment (CMAI).

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over

bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit the use of a full stripcropping pattern.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet

close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material

through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between the individuals. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. A firebreak also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is

usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothills. A region of relatively low, rounded hills at the base of a mountain range.

Foot slope. The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface profile is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Giant ripple mark. The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. A gullied map unit is one that has numerous gullies.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or

layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and are less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as

contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made

by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame terrace. A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake plain. A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Lateral moraine. A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low-residue crops. Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Mean annual increment (MAI). The average annual increase in volume of a tree during the entire life of the tree.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine. An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—

few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

- Mountain.** A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.
- Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)
- Mudstone.** Sedimentary rock formed by induration of silt and clay in approximately equal amounts.
- Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.
- Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)
- Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.
- Observed rooting depth.** Depth to which roots have been observed to penetrate.
- Organic matter.** Plant and animal residue in the soil in various stages of decomposition.
- Outwash plain.** An extensive area of glaciofluvial material that was deposited by meltwater streams.
- Overstory.** The trees in a forest that form the upper crown cover.
- Oxbow.** The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.
- Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan, and traffic pan.*
- Parent material.** The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

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

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or

browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata mainly red in color and composed largely of sandstone and shale.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder. The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or

dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine-textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $\text{Ca}^{++} + \text{Mg}^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (*vertical axis of aggregates longer than horizontal*), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects from soil blowing and erosion by water after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in

color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and

clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soil in extremely small amounts. They are essential for plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range of soil moisture conditions.

Tread. The relatively flat terrace surface that was or built by stream or wave action.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within

a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Waterspreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

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