



United States
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Conservation
Service



In cooperation with the
United States Department
of the Interior, Bureau of
Land Management and
Fish and Wildlife Service,
and the Montana
Agricultural Experiment
Station

Soil Survey of Garfield County, Montana



The original maps and tables have been deleted from this online version. Since the soil survey's publication, more data on soil properties may have been collected, new interpretations developed, or existing interpretive criteria modified. Maps and current data tables can be accessed through the Web Soil Survey (<http://websoilsurvey.nrcs.usda.gov/app/>).

How To Use This Soil Survey

The detailed soil maps can be useful in planning the use and management of small areas. They can be accessed at (<http://websoilsurvey.nrcs.usda.gov/app/>). Go to the web site and follow the instructions there to access the maps.

Once the area of of interest (AOI) has been selected, the “Soil Map” tab will provide a view of the detailed soil map and a legend that is hyperlinked to map unit descriptions. Click on the “Soil Data Explorer” tab to access the interpretations and reports. Report categories and subcategories include: Suitabilities and Limitations for Use; Soil Properties and Qualities; and Soil Reports. Intrepretive data can also be accessed at (<http://soildatamart.nrcs.usda.gov/>).

See the **Contents** for sections of this publication that may address your specific needs.

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 (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey. This survey was made cooperatively by the Natural Resources Conservation Service, the United States Department of the Interior, Bureau of Land Management and Fish and Wildlife Service, and the Montana Agricultural Experiment Station. The survey is part of the technical assistance furnished to the Garfield County Conservation District.

Major fieldwork for this soil survey was conducted from 1994 to 2000. Soil names and descriptions were approved in 2000. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2000. The most current official data are available through the NRCS Soil Data Mart Website at <http://soildatamart.nrcs.usda.gov>.

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Cover: Photograph of the Missouri River Breaks, located in northern Garfield County.

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the Soil Data Mart at <http://soildatamart.nrcs.usda.gov/> or
Web Soil Survey at <http://websoilsurvey.nrcs.usda.gov/app/>.

Foreword

This soil survey contains information that can be used in land-planning programs in Garfield 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, 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 zone with wet soil moisture status high in the profile 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. Broad areas of soils are shown on the general soil map. 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.

Dave White
State Conservationist
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Soil Survey of Garfield County, Montana

Fieldwork by William Drummond, Charles Gephart, Christine Klement, Howard Main, Jerome Setera, and Robert Wegmann, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with United States Department of Interior - Bureau of Land Management and Fish and Wildlife Service, and the Montana Agricultural Experiment Station

Garfield County is located in the east-central part of Montana (fig. 1). It has a total area of 3,102,900 acres of which 228,600 acres are water in bodies of more than 40 acres. It is bordered on the north by Fort Peck Reservoir, on the west by the Musselshell River, on the south by Rosebud County, and on the east by McCone, Prairie, and Custer Counties. The county seat is Jordan, which is in the central part of the county. Garfield County is located entirely within Major Land Resource Area 58A-Northern Rolling High Plains, Northern Part.

About 72 percent of the county is in private ownership, 23 percent is federal land, and 5 percent is state land. The federal land is administered by the Bureau of Land Management and the U.S. Fish and Wildlife Service. Rangeland constitutes the largest land use in the county, while dryland crops include wheat, barley, and oats.

General Nature of the Survey Area

The following sections describe some of the environmental and cultural features that affect the use and management of soils in the survey area. These features are

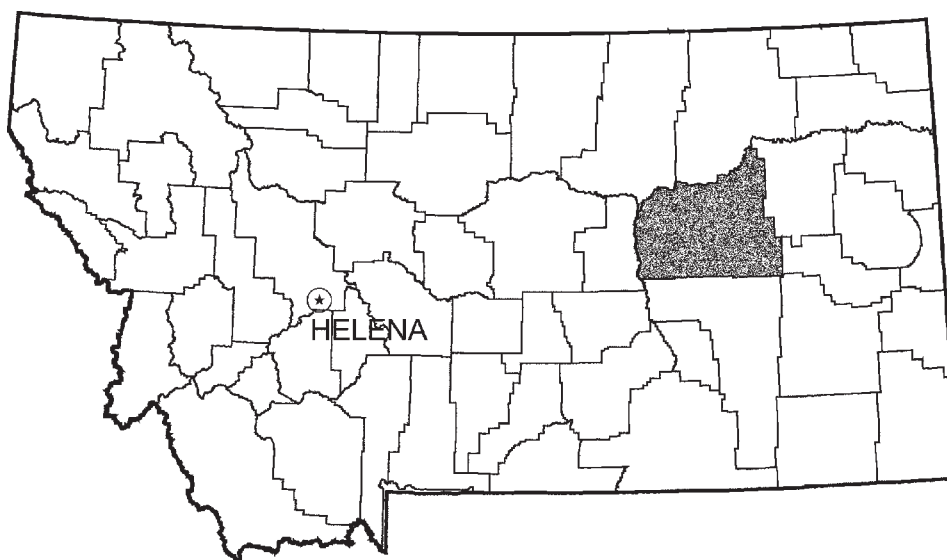


Figure 1. Location of Garfield County in Montana.

physiography, drainage and geology; oil and gas; coal; mineral resources; ground water; and climate.

Physiography, Drainage, and Geology

Physiography

Garfield County lies wholly within the Great Plains Physiographic Province, at the western edge of the Williston Basin. A thin band two to twelve miles wide at the northern border of the county lies within the Glaciated Missouri Plateau, marking the furthest advance of the large glaciers of the Pleistocene ice ages.

Elevations range from the normal operating level of Fort Peck Lake, at 2,246 feet above sea level, to a high of 3,620 feet on an unnamed butte southwest of Mother Butte, near the southern county border. Average elevations are between 3,000 and 3,100 feet in the central portion of the county, sloping gently to average elevations of 2,600 feet near Fort Peck Lake. The highest points are isolated buttes near the southern county border, with elevations between 3,200 and 3,620 feet.

Most of Garfield County is characterized by rolling prairies, broad shallow valleys, and scattered buttes. The rugged badland topography of the Missouri Breaks is characterized by numerous deep canyons separated by steep, narrow ridges. There are sheer, inaccessible bluffs along the Missouri River channel in the central portion of the county. Hummocky terrain resulting from mudflows and slumping in soft, shale bedrock is common.

Drainage

Most of Garfield County is drained by Big Dry Creek, which, prior to the construction of Fort Peck Dam, joined the Missouri River at the northeast corner of the county. The creek is often intermittent after about mid-July, although it contains pools of water, which remain in the channel throughout the year. Jordan is located on Big Dry Creek, and Montana State Highway 200 follows the creek east to the county line.

The Missouri Breaks are drained by numerous short, deeply incised streams which flow to the north. The western quarter of the county is drained by the Musselshell River. The southeastern portion of the county is drained by Little Dry Creek.

Calf and Lodgepole Creeks are the major tributaries to the Musselshell River in Garfield County. Major tributaries to Big Dry Creek from the north are Lone Tree, Smoky Butte, Vail, Frazier, Woody, and Flat Creeks. Major tributaries to Big Dry Creek from the south are Sand and Little Dry Creeks.

Geology

Garfield County is underlain by a sequence of sedimentary strata that is at least 7,000 feet thick, ranging in age from Cambrian to Tertiary. They rest unconformably on Precambrian crystalline basement rocks at depth.

MESOZOIC "MIDDLE LIFE" SYSTEM—245 to 66 million years ago

Cretaceous Period

The oldest rocks exposed in Garfield County belong to the middle part of the Colorado Group, which is a sequence of formations composed primarily of marine shale. It is 1,500-2,000 feet thick, and has been subdivided into the following six formations: the Thermopolis Shale, Mowry Shale, Belle Fourche Shale, Greenhorn

Formation, Carlile Shale, and Niobrara Formation. They crop out in a roughly concentric pattern within a 5-mile radius around the town of Mosby, in the Cat Creek Anticline, where the Musselshell River cuts across the Mosby Dome.

Shales in the lower part of the Belle Fourche Formation are the oldest rocks of the Colorado Group to crop out in Garfield County. They occur east of the Musselshell River channel in the area north of Mosby. They are overlain by the Greenhorn Formation with the Mosby Sandstone Member, and the Carlile and Niobrara Formations, which crop out in the low, rounded hills east of Mosby and the lower reaches of Sage Hen Creek. In general, all these formations consist primarily of bentonitic shales with interbeds of siltstone, sandstone, and bentonite. Typical soils derived from these shaly formations include the Neldore and Volborg series.

The Montana Group overlies the Colorado Group, and contains marginal marine and continental deposits. It has been subdivided into the following formations: the Telegraph Creek Formation, Eagle Formation, Claggett Shale, Judith River Formation, Bearpaw Shale, and Fox Hills Formation. The formations crop out in a band which extends west from Fort Peck Dam along the lakeshore, up the Musselshell River, along the edge of the Cat Creek Anticline, and to the center of the southern county border where it turns to the south.

The oldest, the Telegraph Creek Formation, is a transitional unit between the Niobrara Shale and the sandstones of the overlying Eagle Formation. It consists of sandy shales that weather to light gray, with brick-red concretions at the base. The formation becomes sandier upward towards the base of the Eagle Formation. Exposures are minimal in Garfield County, where it crops out in a concentric pattern at the edge of the Cat Creek Anticline. Typical soils derived from the Telegraph Creek Formation include the Cabbart, Yawdim, and Gerdrum series.

The Eagle Formation generally consists of light gray sandstone, with thin sequences of marine and nonmarine shale and mudstone. East of the Musselshell River, the formation becomes finer grained. It thickens from an average of 500 feet in the western portion of the county to more than 700 feet at its eastern margin. It appears to be missing completely on the southeast side of the Cat Creek Anticline near the highway. Typical soils derived from this formation include the Cabbart, Blacksheep, Yamacall, and Eapa series.

The Claggett Formation consists of gray shales that commonly weather to a velvety brown, and contain orange, calcareous concretions that are highly fractured. In the upper part of the formation, the concretions are white and football sized. Total thickness is approximately 750 feet. Typical soils derived from this formation include the Neldore, Volborg, and Gerdrum series.

The Judith River Formation consists of carbonaceous mudstone with some interbedded coal and sandstone channels. These sandstone channels are used as aquifers in some areas, where they are large and fairly continuous. The formation is up to 500 feet thick in the western part of the county, thinning to 100-200 feet in the eastern part. As the formation thins to the east, it grades into a predominantly marine sandstone with thin shale and siltstone interbeds. It grades upward into the Bearpaw Shale. Typical soils derived from this formation include the Cabbart, Yawdim, Twilight, and Busby series.

The Bearpaw Shale is composed of 900-1,100 feet of gray to black, bentonitic marine shales. Where it is exposed at the surface, it forms either relatively subdued badlands or a terrain of small hills with gentle slopes.

The upper part of the formation weathers to a brownish color and is fossiliferous. It includes thin beds of sandstone, cherty material, and a variety of concretions. They include fossiliferous ironstone, limestone, and septarian concretions ranging from a few inches up to eight feet in diameter. (Septarian concretions are large, roughly spheroidal nodules, traversed within by a network of cracks filled with calcite

and other minerals.) Some ironstone concretions are oval-shaped and contain bits of lustrous shell material, which formed in and around the shells of flat-coiled ammonites. Clear and smoky gray colored barite fills cracks and cavities in a few of the concretions. Bentonite is found disseminated throughout the formation and in discrete beds up to six feet thick. Typical soils derived from this formation include the Neldore, Abor, Marvan, Weingart, and Gerdrum series.

The Fox Hills Formation is the youngest unit of the Montana Group. While there is a great deal of variability in its degree of cementation, much of the formation is poorly consolidated. It often forms foothills to the more consolidated cliffs in the overlying Hell Creek Formation, so it is not well exposed.

The lower portion of the Fox Hills Formation consists of sandstone, siltstone, and shale interbeds, which are transitional from the underlying shales of the Bearpaw Formation, to the overlying sandstones of the middle and upper portions of the formation. The upper portion of the formation is an old shoreline deposit that is composed of fine- to medium-grained tan sandstone which appears to be massive, but also contains some crossbedding, and characteristically becomes coarser upward. It is used extensively as an aquifer.

The formation varies in thickness from 35 to 150 feet depending on whether or not the white-weathering unit is included in the Fox Hills or included at the base of the overlying Hell Creek Formation. Typical soils derived from the Fox Hills Formation include the Blacksheep, Chinook, and Twilight series.

The last formation deposited during the Cretaceous Period was the Hell Creek Formation which overlies the Fox Hills. This is an enormous deposit which extends up from New Mexico through Colorado and Wyoming, across Montana, and into North Dakota, South Dakota, Saskatchewan, and Manitoba. The formation was named for exposures in Hell Creek, in northern Garfield County, where its type section (the sequence of strata that constitute a particular stratigraphic unit in the location where it was originally recognized and described) is exposed in its full thickness.

The Hell Creek Formation characteristically erodes into spectacular badlands where relatively hard concretions and sandstone lenses have protected softer, underlying shales and mudstones from erosion. South of Fort Peck Lake differential erosion has created a rugged landscape, where concretions form mid-slope ledges and cap the tops of buttes and ridges, and the underlying softer materials have eroded into intricate, rilled patterns. Trees are common on the formation on north-facing slopes.

The Hell Creek Formation varies in thickness in the area from 200-300 feet. It is composed primarily of soft shale, siltstone, and silty sandstone, and characteristically has a banded appearance in shades of purple, green, and gray. Thin, discontinuous coal seams, carbonaceous shales, and bentonite are also common. Large-scale crossbedding is common in the sandstone lenses, all of which are lenticular. The sandstones contain abundant lens-shaped and log-shaped concretions which can be several yards across.

The formation contains a basal sandstone that is medium grained and crossbedded. In some areas it contains specks of dark colored minerals, leading to a distinctive "salt and pepper" appearance. There are thin lenses of pebble and cobble conglomerate near the base of the formation. This basal sandstone is often combined with the underlying Fox Hills into the "Fox Hills-lower Hell Creek aquifer," which is used as a regional source of relatively soft water.

Fossil plants and dinosaur bones are common in the Hell Creek Formation. This area's contribution to our understanding of the Late Cretaceous Period and the creatures that inhabited it has been significant. Its dinosaur fossils represent the last

and most spectacular phases of their evolution, and include magnificent specimens of both *Tyrannosaurus rex* and *Triceratops*.

Typical soils formed on sandstone bedrock of the Hell Creek Formation include the Chinook, Twilight, and Eapa series. Typical soils formed on the shale bedrock of the Hell Creek Formation include the Yawdim and Sonnett series.

CENOZOIC “RECENT LIFE” SYSTEM—66 million years ago to present

Tertiary Period

The central and southeastern portions of Garfield County are covered by the Fort Union Formation. It is more than 2,000 feet thick where uneroded and has been subdivided on the basis of color, rock type, and the occurrence of coal. The members in this area are the basal Tullock Member, the Lebo Shale, and the upper Tongue River Member.

The Tullock Member is exposed in the central part of the county, including the area around Jordan. It consists of 180-280 feet of light yellow, fine-grained sandstone and siltstone, interbedded with gray, sandy or silty shale. Many of the sandstone beds are crossbedded and the member is frequently used as an aquifer. It contains thin but laterally persistent coal beds that grade upward into light gray, carbonaceous shale. Fossil wood, tree stumps, and plant fragments are abundant. It also contains prominent, bright-orange clinker beds which formed when burning coal baked the surrounding sediments. Typical soils derived from the Tullock Member include the Megonot, Cabbart, Brushton, Kobase, and Cambeth series.

The Lebo Member has a significant outcrop area in central Garfield County, particularly in the area between Cohagen and Sand Creeks. It consists of 200-300 feet of dark gray shale with thin interbeds of fine-grained sandstone, sandy shale, and coal. Calcareous and ironstone concretions are characteristic and weather to small, reddish-brown fragments covering outcrop slopes. In most areas the Lebo Member is easily distinguished from the other members of the Fort Union Formation by its darker color and increased shale content; however, in Garfield County the lithologies are similar. Sparsely vegetated badlands is commonly formed in Lebo outcrops. Typical soils derived from the Lebo Member include the Cambeth, Cabbart, Yawdim, and Weingart series.

The Tongue River Member occurs only in the southeastern portion of the county, as much of it has been removed by erosion. It consists of soft, light colored sandstone with carbonaceous shale and siltstone interbeds. It contains coal seams that are thicker and more persistent than those in the Tullock Member, some of which are of economic importance in other areas.

The sandstone is thick bedded, locally crossbedded, and lenticular. The sandstone beds represent old stream channels, and most grade laterally into siltstone and shale. Typical soils that developed on the sandstone bedrock include the Busby, Twilight, and Blacksheep series. Typical soils developed on shalier bedrock include the Lonna, Cambeth, and Cabbart series.

Garfield County contains one small exposure of Tertiary-aged igneous rocks, which is located approximately eight miles west of Jordan. They are exposed in a linear band approximately 1.5 miles long, with Smoky Butte at its center. It is the smallest and easternmost of a group of high-potassium intrusive rocks known as the Central Montana alkalic province. Smoky Butte is composed of a relatively unusual rock type known as lamproite, that is thought to be derived from the mantle. It was emplaced as a diatreme (a breccia-filled volcanic pipe that was formed by a gaseous explosion) with associated dikes which trend northeast-southwest away from the butte. The Smoky Butte intrusion has baked and deformed the sedimentary rocks of the Fort Union Formation which surround it. It has been age-dated at 27 +/- 3 million years, and similar rock types are explored for diamonds.

Upper Tertiary and Quaternary Deposits

Alluvial deposits occur in most of the stream valleys in this area. In smaller, intermittent streams they are thin and discontinuous, but larger stream valleys such as Big Dry Creek can have thicknesses of over 30 feet. In general, the volume of the deposit reflects the volume of the contributing drainage area. The alluvium is primarily fine grained but does include lenses and stringers of sand and gravel. Typical soils derived from these deposits include the Havre, Hanly, Glendive, and Rivra series.

The shaly formations in this area are prone to landsliding, and earthflows and landslides are common in areas where shale bedrock is exposed. In the Missouri Breaks area they flank valley walls and interfinger with alluvial deposits on the valley floor. In the northern part of the county there are numerous earthflow deposits containing debris from the Hell Creek, Fox Hills, and Bearpaw Formations which have slumped down over the underlying formations, coalescing into a thick mantle of debris that obscures much of the bedrock beneath it. Many of these deposits show signs of recent movement characterized by scarps, transverse ridges, and transverse cracks.

Oil and Gas

Garfield County is located at the edge of the Williston Basin, which is one of the most important oil- and gas-producing regions in North America. There are significant reserves to the southwest, however only the Cat Creek oil field extends into the county itself.

The Cat Creek oil field is a collective name for four small oil fields, three of which are located in Garfield County. The anticline contains ten separate domes; however, oil has only been produced from West Dome, Mosby Dome, Antelope Dome, and East Dome.

The Mosby Dome was the first producing oil field in Montana. Its first production well was completed in 1920 at a depth of 998 feet, and by the end of the year there were 11 producing wells nearby. By July 1926, there were 190 producing wells. In 1922, oil production reached its peak and has been slowly declining since then. There has been no commercial gas production from this area (MTBMG, 1993).

Coal

Interbeds of coal are present in the Fort Union and Judith River Formations. Small mines in the vicinity of Haxby Point and Seven Blackfoot Creek produced minor volumes of coal between the 1920s and 1940s, which was used primarily by ranchers and homesteaders who excavated small outcrops for their own use. Montana coal contains less sulfur than much of the coal mined in Eastern and Midwestern states, although its heat content is often lower.

There are potential reserves of lignite coal in beds greater than 30 inches in the Tongue River Member of the Fort Union Formation. Coal beds within the Judith River Formation are primarily sub-bituminous (which is of better quality than lignite). The coal beds are variable in thickness and in the amount of shale beds and other impurities they contain. Locally, some of these beds are thick enough to be of economic value, but most are discontinuous across large areas. No commercial volumes of coal have been mined in Garfield County.

Mineral Resources

There are no metallic mines or prospects in Garfield County, and no record of any metal production. The area is lacking in evidence of mineral occurrence such as areas of altered rock that are characteristic of mineralization elsewhere, and there is little or no potential for discovering or developing metal deposits in this area.

There are numerous bentonite beds in the Cretaceous shales, particularly the Claggett and Bearpaw Formations, and they occur in thicknesses of a few inches up to six feet. Bentonite is formed through alteration of volcanic ash, and is used commercially as a filler in paper and rubber, a base for cosmetics and medicines, well drilling mud, and a waterproof sealant for wells and ponds. Bentonite was mined from the Bearpaw Shale at the American Colloid Pit near Regina, south of Malta, from 1970 to the mid-1980s; however, none has been commercially developed in Garfield County.

Placer gold has been found in the alluvium in Seven Blackfoot Creek. These deposits are small, have low gold contents, and are contaminated with a high percentage of clay-sized material and landslide debris. The source of the gold is unknown but considered to be distant.

Ground Water

Quantities of water suitable for livestock use can be developed from most of the sandstone bedrock in Garfield County. Unconsolidated alluvium is also a reliable source of small to moderate amounts of water, and in general it has lower total dissolved solids (TDS) concentrations than most bedrock wells.

Most of the water developed from bedrock sources in this area is high in calcium and magnesium and is therefore hard and unsatisfactory for domestic use or irrigation. The water can be used successfully by most livestock. Water in the Fox Hills Formation is generally softer with smaller TDS concentration than water from sandstone beds in the Hell Creek and Fort Union Formations. In some areas near the lower contact of the Fort Union Formation, deep wells are drilled through it to the underlying Fox Hills Formation to maximize water quality and piezometric head in the well.

There are areas along both Little and Big Dry Creeks where it is possible to develop artesian wells, which flow at the surface. The Tullock Member of the Fort Union Formation yields water to flowing wells along Big Dry Creek between Jordan and Van Norman. Downstream from Van Norman, flowing wells can be developed from the Fox Hills aquifer.

Under normal, non-artesian conditions, the depth to an aquifer will be deepest on the interstream divides and shallowest in the valley bottoms. Successfully developing water depends on penetrating a sufficient amount of permeable sandstone interbeds below the water table. In most sandstone formations other than the Fox Hills, these are erratically distributed and their occurrence is difficult to predict.

Climate

The climate of Garfield County is characterized as warm in the summer and cold in the winter with periods of very cold weather. The "Temperature and Precipitation" table provides temperature and precipitation data recorded at Cohagen, Jordan, and Mosby for the period of 1967 to 1990.

In January, the average temperature at Jordan is 20.09 degrees F and the average daily minimum is 7.3 degrees. In summer, the average temperature is 69.5 degrees and the average daily maximum temperature is 86.3 degrees F. Temperatures at other locations in the county are similar.

Growing degree days are also shown in the "Growing Season" table. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Garfield County is semi-arid with the average annual precipitation in the 10- to 14-inch range. Of this, about 67 percent falls in the May through September period.

The "Freeze Dates in Spring and Fall" table shows the probable dates of the first freeze in the fall and the last freeze in the spring at three locations in the county. Also shown are probability of the length of the growing season for temperatures above 24, 28 and 32 degrees F.

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 properties and the subsequent effects on 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.

Individual soils on the landscape commonly 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 soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil 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 (Soil Survey Staff, 1999), 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. Interpretations are modified as necessary 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 zone in which the soil moisture status is wet within certain depths in most years, but they cannot predict that the zone of wet soil moisture status 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.

Detailed Map Units

The map units delineated on the detailed soil maps represent the soils or miscellaneous areas in the survey area. The map unit descriptions, 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.

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, Hillon cobbly loam is a phase of the Hillon series.

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

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. Hillon-Kevin complex, 8 to 15 percent slopes is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Marvan-Gerdrum association, 2 to 15 percent slopes is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Havre and Glendive soils, frequently flooded, channeled is an example.

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

The "Acreage and Proportionate Extent of the Soils" table 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.

3F—Badland

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Badlands

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Badland

Composition: 85 percent

Geomorphic description: None assigned

Additional Components

Abor and similar soils: 3 percent

Cabbart and similar soils: 2 percent

Delpoint and similar soils: 2 percent

Ismay and similar soils: 2 percent

Neldore and similar soils: 2 percent

Ralore and similar soils: 2 percent

Yamacall and similar soils: 2 percent

4A—Ismay silty clay loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Ismay and similar soils

Composition: 85 percent

Geomorphic description: Drainageway

Slope: 0 to 2 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted

Drainage class: Moderately well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Present

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 7.9 inches

Typical profile:

A-0 to 8 inches; silty clay loam

C1-8 to 17 inches; silty clay loam

C2-17 to 25 inches; stratified very fine sandy loam to silty clay loam

C3-25 to 50 inches; stratified clay loam to very fine sandy loam

C4-50 to 60 inches; stratified clay loam to very fine sandy loam

Additional Components

Alona and similar soils: 3 percent

Bigsandy and similar soils: 3 percent

Glendive, saline and similar soils: 3 percent

Havre and similar soils: 3 percent

Lonna and similar soils: 3 percent

5E—Dune land

Map Unit Setting

Field investigation intensity: Order 2

Landscape: Plains, valley

Elevation: 2,300 to 2,400 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Dune land (fig. 2)

Composition: 85 percent

Geomorphic description: Dune

Additional Components

Busby and similar soils: 4 percent

Hanly and similar soils: 4 percent

Yetull and similar soils: 4 percent

Havre and similar soils: 3 percent

6C—Endoaquents, loamy, saline, 0 to 6 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,700 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Endoaquents, saline and similar soils

Composition: 90 percent

Geomorphic description: Depression



Figure 2. An area of map unit 5E - Dune land along Little Dry Creek in eastern Garfield County. Dune land is a miscellaneous land type consisting of sand ridges and intervening troughs that shift with the wind. This map unit produces little or no vegetation.

Slope: 0 to 6 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Poorly drained
Parent material: Alluvium
Flooding: Rare
Water table: Present
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.7 inches

Typical profile:

E-0 to 6 inches; silty clay loam
 C-6 to 30 inches; silty clay loam
 Cg-30 to 60 inches; stratified fine sandy loam to silty clay loam

Additional Components

Vanda and similar soils: 5 percent
 Yawdim and similar soils: 5 percent

7A—Riverwash

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Valley
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Riverwash

Composition: 85 percent
Geomorphic description: None assigned

Additional Components

Bigsandy and similar soils: 3 percent
 Glendive, frequently flooded and similar soils: 3 percent
 Hanly and similar soils: 3 percent
 Havre, frequently flooded and similar soils: 3 percent
 Rivra and similar soils: 3 percent

12B—Antwerp silty clay loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Antwerp and similar soils

Composition: 85 percent
Geomorphic description: Micro-low on alluvial fan; Micro-low on stream terrace
Slope: 0 to 4 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 6.3 inches
Typical profile:
 A-0 to 6 inches; silty clay loam
 Bz-6 to 24 inches; silty clay loam
 BC-24 to 60 inches; silt loam

Additional Components

Davidell and similar soils: 8 percent
 Vanda and similar soils: 7 percent

13E—Bonfri-Bullock, thin surface-Cabbart complex, 4 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,800 to 3,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Bonfri and similar soils

Composition: 30 percent
Geomorphic description: Hill
Slope: 4 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 6 inches; loam
Bt-6 to 13 inches; clay loam
Bk-13 to 32 inches; clay loam
Cr-32 to 60 inches; bedrock

Bullock and similar soils

Composition: 25 percent
Geomorphic description: Hill
Slope: 4 to 8 percent
Elevation: 2,800 to 3,500 feet
Effective annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days
Surface layer texture: Clay loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.4 inches

Typical profile:

E-0 to 7 inches; clay loam
Btn-7 to 11 inches; clay loam
Bkz-11 to 27 inches; sandy clay loam
Cr-27 to 60 inches; bedrock

Cabbart and similar soils

Composition: 25 percent
Geomorphic description: Hill
Slope: 8 to 25 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Typical profile:

A-0 to 4 inches; loam
Bk-4 to 16 inches; loam
Cr-16 to 60 inches; bedrock

Additional Components

Abor and similar soils: 4 percent
Foreleft and similar soils: 4 percent
Gerdrum and similar soils: 4 percent
Neldore and similar soils: 4 percent
Rock outcrop, soft: 2 percent
Yamacall and similar soils: 2 percent

20E—Neldore-Abor silty clays, 15 to 35 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Neldore and similar soils

Composition: 45 percent

Geomorphic description: Hill

Slope: 8 to 25 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Clayey residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

Typical profile:

A-0 to 3 inches; silty clay

C1-3 to 12 inches; clay

C2-12 to 18 inches; clay

Cr-18 to 60 inches; bedrock

Abor and similar soils

Composition: 40 percent

Geomorphic description: Hill

Slope: 8 to 15 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.5 inches

Typical profile:

A-0 to 5 inches; silty clay

Bss-5 to 11 inches; silty clay

Bky-11 to 23 inches; silty clay

Cr-23 to 60 inches; bedrock

Additional Components

Delpoint and similar soils: 4 percent

Gerdrum and similar soils: 4 percent

Marvan and similar soils: 4 percent

Cabbart and similar soils: 3 percent

21C—Absher silty clay loam, 0 to 8 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Absher and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 8 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

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: Mainly 4.0 inches

Typical profile:

E-0 to 2 inches; silty clay loam

Btn-2 to 13 inches; silty clay

Bkny-13 to 30 inches; silty clay loam

Bz-30 to 60 inches; stratified clay to loamy sand

Additional Components

Davidell and similar soils: 4 percent

Vanda and similar soils: 4 percent

Weingart and similar soils: 4 percent

Gerdrum and similar soils: 3 percent

22B—Alona silt loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Alona and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 7.0 inches

Typical profile:

A-0 to 3 inches; silt loam
 Bw1-3 to 11 inches; silty clay loam
 Bw2-11 to 16 inches; silty clay loam
 Bk-16 to 20 inches; silty clay loam
 Bz-20 to 60 inches; silty clay loam

Additional Components

Lonna and similar soils: 10 percent
 Yamacall and similar soils: 5 percent

24F—Neldore-Volborg, moist, silty clays, 15 to 60 percent slopes

Map Unit Setting

Interpretive focus: Rangeland, forestland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Neldore and similar soils

Composition: 50 percent
Geomorphic description: Hill
Slope: 15 to 60 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches
Typical profile:
 A-0 to 3 inches; silty clay
 C-3 to 18 inches; clay
 Cr-18 to 60 inches; bedrock

Volborg, moist and similar soils

Composition: 40 percent
Geomorphic description: Hill
Slope: 15 to 60 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.7 inches
Typical profile:
A-0 to 3 inches; silty clay
C-3 to 14 inches; silty clay
Cr-14 to 60 inches; bedrock

Additional Components

Lostriver and similar soils: 3 percent
Marvan and similar soils: 3 percent
Rock outcrop, soft: 2 percent
Vanda and similar soils: 2 percent

25E—Volborg silty clay, 8 to 35 percent slopes**Map Unit Setting**

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description**Volborg and similar soils**

Composition: 85 percent
Geomorphic description: Hill
Slope: 8 to 35 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches
Typical profile:
A-0 to 3 inches; silty clay
C-3 to 15 inches; silty clay
Cr-15 to 60 inches; bedrock

Additional Components

Neldore and similar soils: 5 percent
 Rock outcrop, soft: 5 percent
 Weingart and similar soils: 5 percent

25F—Neldore-Yawdim silty clays, 15 to 60 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Neldore and similar soils

Composition: 45 percent
Geomorphic description: Hill
Slope: 15 to 60 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches
Typical profile:
 A-0 to 3 inches; silty clay
 C-3 to 18 inches; clay
 Cr-18 to 60 inches; bedrock

Yawdim and similar soils

Composition: 40 percent
Geomorphic description: Hill
Slope: 15 to 60 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale and siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.1 inches
Typical profile:
 A-0 to 3 inches; silty clay
 C-3 to 18 inches; silty clay loam
 Cr-18 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 5 percent
 Rock outcrop, soft: 5 percent

Abor and similar soils: 3 percent
Marvan and similar soils: 2 percent

29C—Brunelda silty clay, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,800 to 3,630 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Brunelda and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium derived from shale
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.0 inches
Typical profile:
A-0 to 1 inch; silty clay
Bw-1 to 3 inches; silty clay
Byz1-3 to 12 inches; silty clay
Byz2-12 to 42 inches; silty clay
BC-42 to 60 inches; silty clay

Additional Components

Gerdrum and similar soils: 5 percent
Nobe and similar soils: 5 percent
Vaeda and similar soils: 5 percent

30B—Brushton silt loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Brushton and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 4 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.2 inches
Typical profile:
 A-0 to 6 inches; silt loam
 Bt-6 to 18 inches; silty clay loam
 Bk-18 to 36 inches; silt loam
 BC-36 to 60 inches; silt loam

Additional Components

Cambeth and similar soils: 3 percent
 Kobase and similar soils: 3 percent
 Lonna and similar soils: 3 percent
 Ralph and similar soils: 3 percent
 Sonnett and similar soils: 3 percent

31C—Busby fine sandy loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Busby and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium, eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches
Typical profile:
 A-0 to 4 inches; fine sandy loam
 Bw-4 to 13 inches; fine sandy loam

Bk-13 to 47 inches; fine sandy loam

C-47 to 60 inches; fine sandy loam

Additional Components

Cambeth and similar soils: 3 percent

Kobase and similar soils: 3 percent

Twilight and similar soils: 3 percent

Yamacall and similar soils: 3 percent

Yetull and similar soils: 3 percent

31D—Busby fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Busby and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 8 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.1 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bw-4 to 12 inches; fine sandy loam

Bk-12 to 36 inches; fine sandy loam

C-36 to 60 inches; loamy fine sand

Additional Components

Blacksheep and similar soils: 5 percent

Rock outcrop, soft: 5 percent

Twilight and similar soils: 5 percent

36E—Cabbart silt loam, 15 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Cabbart and similar soils

Composition: 85 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Typical profile:

A-0 to 4 inches; silt loam

Bk-4 to 13 inches; loam

Cr-13 to 60 inches; bedrock

Additional Components

Busby and similar soils: 4 percent

Yawdim and similar soils: 4 percent

Fleak and similar soils: 3 percent

Rock outcrop, soft: 2 percent

Yamacall and similar soils: 2 percent

36F—Rock outcrop, soft

Map Unit Setting

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Rock outcrop, soft

Composition: 80 percent

Geomorphic description: None assigned

Additional Components

Rock outcrop, hard: 5 percent

Cabbart and similar soils: 4 percent

Kirby and similar soils: 4 percent

Yawdim and similar soils: 4 percent

Abandoned mines: 3 percent

37C—Abor-Marvan silty clays, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Abor and similar soils

Composition: 45 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

Typical profile:

A-0 to 5 inches; silty clay

Bss-5 to 11 inches; silty clay

Bky-11 to 30 inches; silty clay

Cr-30 to 60 inches; bedrock

Marvan and similar soils

Composition: 40 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Silty clay

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Clayey alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.7 inches

Typical profile:

A-0 to 6 inches; silty clay

Bss-6 to 30 inches; silty clay

Byz-30 to 60 inches; silty clay

Additional Components

Neldore and similar soils: 8 percent

Vaeda and similar soils: 7 percent

38C—Chinook fine sandy loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Chinook and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.4 inches

Typical profile:

A-0 to 14 inches; fine sandy loam

Bw-14 to 24 inches; fine sandy loam

Bk-24 to 60 inches; fine sandy loam

Additional Components

Delpoint and similar soils: 5 percent

Kremlin and similar soils: 5 percent

Twilight and similar soils: 5 percent

39C—Creed loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Creed and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained
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: Mainly 6.5 inches

Typical profile:

A-0 to 7 inches; loam
 Btn-7 to 15 inches; silty clay
 Bky-15 to 28 inches; silty clay loam
 By-28 to 60 inches; stratified loam to silty clay loam

Additional Components

Davidell and similar soils: 3 percent
 Gerdrum and similar soils: 3 percent
 Kobase and similar soils: 3 percent
 Ethridge and similar soils: 2 percent
 Sonnett and similar soils: 2 percent
 Vanda and similar soils: 2 percent

41B—Davidell silty clay loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Davidell and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 4 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.1 inches
Typical profile:
 E-0 to 4 inches; silty clay loam
 Bt-4 to 9 inches; clay loam
 Bk-9 to 38 inches; clay loam
 Byz-38 to 60 inches; silty clay loam

Additional Components

Alona and similar soils: 3 percent
 Antwerp and similar soils: 3 percent
 Gerdrum and similar soils: 3 percent
 Ivanell and similar soils: 3 percent
 Kobase and similar soils: 3 percent

47B—Ethridge silty clay loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Ethridge and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 4 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 6 inches; silty clay loam
 Bt-6 to 12 inches; silty clay
 Bk-12 to 27 inches; silty clay loam
 Bky-27 to 37 inches; silty clay loam
 C-37 to 63 inches; silt loam

Additional Components

Eapa and similar soils: 4 percent
 Kobase and similar soils: 4 percent
 Sonnett and similar soils: 4 percent
 Lonna and similar soils: 3 percent

47C—Ethridge silty clay loam, 4 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Ethridge and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 4 to 8 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 6 inches; silty clay loam

Bt-6 to 12 inches; silty clay

Bk-12 to 27 inches; silty clay loam

Bky-27 to 37 inches; silty clay loam

C-37 to 63 inches; silt loam

Additional Components

Eapa and similar soils: 4 percent

Kobase and similar soils: 4 percent

Sonnett and similar soils: 4 percent

Lonna and similar soils: 3 percent

48B—Eapa loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Eapa and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.6 inches

Typical profile:

A-0 to 8 inches; loam

Bt-8 to 24 inches; clay loam

Bk-24 to 60 inches; clay loam

Additional Components

Chinook and similar soils: 3 percent

Ethridge and similar soils: 3 percent

Kremlin and similar soils: 3 percent

Lonna and similar soils: 3 percent

Sonnett and similar soils: 3 percent

48C—Eapa loam, 4 to 8 percent slopes**Map Unit Setting***Interpretive focus:* Cropland, rangeland*Field investigation intensity:* Order 2*Landscape:* Plains*Elevation:* 2,240 to 3,620 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 105 to 135 days**Component Description****Eapa and similar soils***Composition:* 85 percent*Geomorphic description:* Alluvial fan*Slope:* 4 to 8 percent*Surface layer texture:* Loam*Depth to restrictive feature:* None noted*Drainage class:* Well drained*Parent material:* Loamy alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.6 inches**Typical profile:**

A-0 to 8 inches; loam

Bt-8 to 24 inches; clay loam

Bk-24 to 60 inches; clay loam

Additional Components

Chinook and similar soils: 3 percent

Ethridge and similar soils: 3 percent

Kremlin and similar soils: 3 percent

Lonna and similar soils: 3 percent

Ralph and similar soils: 3 percent

52B—Floweree silt loam, 0 to 4 percent slopes**Map Unit Setting***Interpretive focus:* Cropland, rangeland*Field investigation intensity:* Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Floweree and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent

Surface layer texture: Silt loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.3 inches

Typical profile:

Ap-0 to 7 inches; silt loam

Bw-7 to 12 inches; silt loam

Bk-12 to 38 inches; silt loam

BC-38 to 60 inches; stratified silty clay loam to very fine sandy loam

Additional Components

Brushton and similar soils: 3 percent

Cambeth, noncalcareous and similar soils: 3 percent

Cambeth and similar soils: 3 percent

Ethridge and similar soils: 3 percent

Lonna and similar soils: 3 percent

52C—Floweree silt loam, 4 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Floweree and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 4 to 8 percent

Surface layer texture: Silt loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.3 inches

Typical profile:

Ap-0 to 7 inches; silt loam

Bw-7 to 12 inches; silt loam

Bk-12 to 38 inches; silt loam

BC-38 to 60 inches; stratified silty clay loam to very fine sandy loam

Additional Components

Cambeth, noncalcareous and similar soils: 4 percent

Cambeth and similar soils: 3 percent

Lonna and similar soils: 3 percent

Yamacall and similar soils: 3 percent

Chinook and similar soils: 2 percent

53C—Foreleft-Gerdrum complex, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,500 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Foreleft and similar soils

Composition: 60 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.5 inches

Typical profile:

A-0 to 6 inches; loam

Bt-6 to 22 inches; clay loam

Bk-22 to 60 inches; loam

Gerdrum and similar soils

Composition: 35 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

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: Mainly 6.1 inches

Typical profile:

Ap-0 to 7 inches; clay loam

Btn-7 to 18 inches; silty clay loam

Bknyz-18 to 25 inches; clay

Bz-25 to 60 inches; clay loam

Additional Components

Davidell and similar soils: 3 percent

Slickspots and similar soils: 2 percent

59A—Hanly loamy fine sand, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains, valley

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Hanly and similar soils

Composition: 85 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Loamy fine sand

Depth to restrictive feature: None noted

Drainage class: Somewhat excessively drained

Parent material: Sandy alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 5.8 inches

Typical profile:

A-0 to 8 inches; loamy fine sand

C-8 to 60 inches; stratified fine sandy loam to sand

Additional Components

Busby and similar soils: 3 percent

Glendive and similar soils: 3 percent

Rivra and similar soils: 3 percent

Havre and similar soils: 2 percent

Ryell and similar soils: 2 percent

Yetull and similar soils: 2 percent

60A—Harlake silty clay, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains, valley

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Harlake and similar soils

Composition: 85 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Silty clay

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Clayey alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.4 inches

Typical profile:

A-0 to 3 inches; silty clay

C-3 to 60 inches; stratified clay to silt loam

Additional Components

Glendive and similar soils: 5 percent

Havre and similar soils: 5 percent

Marvan and similar soils: 5 percent

61A—Havre loam, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains, valley

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Havre and similar soils

Composition: 85 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 10 inches; loam
 C-10 to 60 inches; stratified fine sandy loam to clay loam

Additional Components

Glendive and similar soils: 4 percent
 Harlake and similar soils: 4 percent
 Ryell and similar soils: 4 percent
 Lonna and similar soils: 3 percent

63C—Hillon loam, 2 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,000 to 2,500 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description**Hillon and similar soils**

Composition: 85 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.2 inches
Typical profile:
 A-0 to 7 inches; loam
 Bk-7 to 60 inches; loam

Additional Components

Sunburst and similar soils: 4 percent
 Telstad and similar soils: 4 percent
 Thoeny and similar soils: 4 percent
 Yamacall and similar soils: 3 percent

66B—Kobase silty clay loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Kobase and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

Ap-0 to 7 inches; silty clay loam

Bw-7 to 15 inches; silty clay loam

Bk-15 to 31 inches; silty clay loam

Bky-31 to 60 inches; silty clay loam

Additional Components

Gerdrum and similar soils: 4 percent

Sonnett and similar soils: 4 percent

Yamacall and similar soils: 4 percent

Megonot and similar soils: 3 percent

66C—Kobase silty clay loam, 4 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Kobase and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 4 to 8 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches
Typical profile:
Ap-0 to 6 inches; silty clay loam
Bw-6 to 15 inches; silty clay loam
Bk-15 to 31 inches; silty clay loam
Bky-31 to 60 inches; silty clay loam

Additional Components

Gerdrum and similar soils: 4 percent
Sonnett and similar soils: 4 percent
Yamacall and similar soils: 4 percent
Megonot and similar soils: 3 percent

66D—Kobase silty clay loam, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Kobase and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 8 to 15 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches
Typical profile:
Ap-0 to 6 inches; silty clay loam
Bw-6 to 15 inches; silty clay loam
Bk-15 to 31 inches; silty clay loam
Bky-31 to 60 inches; silty clay loam

Additional Components

Gerdrum and similar soils: 4 percent
Sonnett and similar soils: 4 percent
Yamacall and similar soils: 4 percent
Megonot and similar soils: 3 percent

67C—Kremlin loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Kremlin and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.3 inches

Typical profile:

A-0 to 8 inches; loam

Bw-8 to 14 inches; loam

Bk-14 to 40 inches; loam

BC-40 to 60 inches; stratified sandy loam to silt loam

Additional Components

Chinook and similar soils: 5 percent

Delpoint and similar soils: 5 percent

Yamacall and similar soils: 5 percent

70B—Lonna silt loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Lonna and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent

Surface layer texture: Silt loam

Depth to restrictive feature: None noted

Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 5 inches; silt loam
Bw-5 to 10 inches; silt loam
Bk-10 to 30 inches; silt loam
BC-30 to 60 inches; silty clay loam

Additional Components

Alona and similar soils: 4 percent
Cambeth and similar soils: 4 percent
Floweree and similar soils: 4 percent
Busby and similar soils: 3 percent

70C—Lonna silt loam, 4 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Lonna and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 4 to 8 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 5 inches; silt loam
Bw-5 to 10 inches; silt loam
Bk-10 to 30 inches; silt loam
BC-30 to 60 inches; silty clay loam

Additional Components

Alona and similar soils: 3 percent
Busby and similar soils: 3 percent
Cabbart and similar soils: 3 percent
Cambeth and similar soils: 3 percent
Floweree and similar soils: 3 percent

72A—McKenzie silty clay, 0 to 2 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

McKenzie and similar soils

Composition: 85 percent

Geomorphic description: Depression

Slope: 0 to 2 percent

Surface layer texture: Silty clay

Depth to restrictive feature: None noted

Drainage class: Poorly drained

Parent material: Clayey alluvium

Native plant cover type: Rangeland

Flooding: None

Water table: Present

Ponding duration: Long

Salt affected: Saline within 30 inches

Available water capacity: Mainly 8.9 inches

Typical profile:

Ag-0 to 1 inch; silty clay

Bg-1 to 23 inches; clay

C-23 to 60 inches; clay

Additional Components

Brunelda and similar soils: 10 percent

Marvan and similar soils: 5 percent

74A—Marvan silty clay, 0 to 2 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,600 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Marvan and similar soils

Composition: 85 percent

Geomorphic description: Stream terrace

Slope: 0 to 2 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Clayey alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.6 inches

Typical profile:

A-0 to 3 inches; silty clay
Bss-3 to 30 inches; silty clay
Byz-30 to 60 inches; silty clay

Additional Components

Gerdrum and similar soils: 8 percent
Vaeda and similar soils: 7 percent

74C—Marvan silty clay, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,600 to 3,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Marvan and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Clayey alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.7 inches

Typical profile:

A-0 to 5 inches; silty clay
Bss-5 to 27 inches; silty clay
Byz-27 to 60 inches; silty clay

Additional Components

Gerdrum and similar soils: 8 percent
Vaeda and similar soils: 7 percent

75D—Cabbart-Delpoint-Cabbart, moist, loams, 4 to 35 percent slopes

Map Unit Setting

Interpretive focus: Rangeland, forestland

Field investigation intensity: Order 2

Landscape: Plains (fig. 3)

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Cabbart and similar soils

Composition: 5 to 55 percent

Geomorphic description: Hill

Slope: 8 to 35 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches



Figure 3. A typical area of map unit 75D - Cabbart-Delpoint-Cabbart, moist loams, 4 to 35 percent slopes, in western Garfield County. Ponderosa pine dominates the shallow Cabbart, moist soil on ridge tops and shaded sideslopes. The Delpoint and Cabbart soils have grassland plant communities.

Typical profile:

A-0 to 3 inches; loam
 Bk-3 to 12 inches; silt loam
 BC-12 to 17 inches; loam
 Cr-17 to 60 inches; bedrock

Delpoint and similar soils

Composition: 30 percent
Geomorphic description: Hill
Slope: 4 to 15 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum, loamy alluvium, loamy colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Typical profile:

A-0 to 3 inches; loam
 Bw-3 to 12 inches; loam
 Bk-12 to 28 inches; loam
 Cr-28 to 60 inches; bedrock

Cabbart, moist and similar soils

Composition: 5 to 55 percent
Geomorphic description: Hill
Slope: 8 to 35 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.9 inches

Typical profile:

A-0 to 2 inches; loam
 Bk-2 to 17 inches; loam
 Cr-17 to 60 inches; bedrock

Additional Components

Blacksheep and similar soils: 3 percent
 Magonot and similar soils: 3 percent
 Twilight and similar soils: 2 percent
 Yawdim and similar soils: 2 percent

75E—Cabbart, moist-Blacksheep-Delpoint complex, 6 to 60 percent slopes

Map Unit Setting

Interpretive focus: Rangeland, forestland
Field investigation intensity: Order 2
Landscape: Plains

Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Cabbart, moist and similar soils

Composition: 5 to 40 percent
Geomorphic description: Hill
Slope: 15 to 60 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.9 inches
Typical profile:
A-0 to 3 inches; loam
Bk-3 to 12 inches; loam
BC-12 to 17 inches; loam
Cr-17 to 60 inches; bedrock

Blacksheep and similar soils

Composition: 25 percent
Geomorphic description: Hill
Slope: 6 to 60 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.4 inches
Typical profile:
A-0 to 6 inches; fine sandy loam
Bk-6 to 16 inches; fine sandy loam
Cr-16 to 60 inches; bedrock

Delpoint and similar soils

Composition: 20 percent
Geomorphic description: Hill
Slope: 6 to 15 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum, loamy alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches
Typical profile:
A-0 to 3 inches; loam
Bw-3 to 12 inches; loam
Bk-12 to 28 inches; loam
Cr-28 to 60 inches; bedrock

Additional Components

Rock outcrop, soft: 8 percent
Cabbart and similar soils: 5 to 40 percent
Yawdim and similar soils: 5 percent
Rock outcrop, hard: 2 percent

79D—Neldore silty clay, 2 to 12 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Neldore and similar soils

Composition: 85 percent
Geomorphic description: Knoll
Slope: 2 to 12 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches

Typical profile:

A-0 to 3 inches; silty clay
C1-3 to 12 inches; clay
C2-12 to 18 inches; clay
Cr-18 to 60 inches; bedrock

Additional Components

Abor and similar soils: 3 percent
Delpoint and similar soils: 3 percent
Gerdrum and similar soils: 3 percent
Marvan and similar soils: 3 percent
Rock outcrop, soft: 3 percent

79E—Neldore silty clay, 4 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Neldore and similar soils

Composition: 85 percent
Geomorphic description: Hill
Slope: 4 to 25 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.7 inches
Typical profile:
 A-0 to 2 inches; silty clay
 C-2 to 12 inches; clay
 Cr-12 to 60 inches; bedrock

Additional Components

Abor and similar soils: 4 percent
 Marvan and similar soils: 4 percent
 Vaeda and similar soils: 4 percent
 Rock outcrop, soft: 3 percent

86C—Archin loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Archin and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Sandy alluvium, loamy alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.1 inches

Typical profile:

A-0 to 4 inches; loam
 E-4 to 7 inches; loam
 Btn-7 to 20 inches; clay loam
 Bky-20 to 28 inches; loam
 C-28 to 60 inches; loam

Additional Components

Delpoint and similar soils: 3 percent
 Eapa and similar soils: 3 percent
 Gerdrum and similar soils: 3 percent
 Sonnett and similar soils: 3 percent
 Yamacall and similar soils: 3 percent

87A—Ryell very fine sandy loam, 0 to 2 percent slopes, occasionally flooded**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Valley
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description**Ryell and similar soils**

Composition: 85 percent
Geomorphic description: Flood plain
Slope: 0 to 2 percent
Surface layer texture: Very fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: Mainly 5.1 inches
Typical profile:
 A-0 to 9 inches; very fine sandy loam
 C1-9 to 25 inches; stratified very fine sandy loam to silt loam
 2C2-25 to 60 inches; extremely gravelly loamy sand

Additional Components

Bigsandy and similar soils: 3 percent
 Glendive and similar soils: 3 percent
 Hanly and similar soils: 3 percent
 Havre and similar soils: 3 percent
 Rivra and similar soils: 3 percent

90A—Sonnett silty clay loam, thin surface, 0 to 2 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Sonnett and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

E-0 to 2 inches; loam

Bt-2 to 14 inches; silty clay

Bk-14 to 25 inches; clay loam

Bky-25 to 60 inches; clay loam

Additional Components

Kobase and similar soils: 3 percent

Sonnett and similar soils: 3 percent

Vanda and similar soils: 3 percent

Weingart and similar soils: 3 percent

Yamacall and similar soils: 3 percent

90C—Sonnett silty clay loam, thin surface, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Sonnett and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

E-0 to 2 inches; loam

Bt-2 to 14 inches; silty clay

Bk-14 to 25 inches; clay loam

Bky-25 to 60 inches; clay loam

Additional Components

Kobase and similar soils: 3 percent

Sonnett and similar soils: 3 percent

Vanda and similar soils: 3 percent

Weingart and similar soils: 3 percent

Yamacall and similar soils: 3 percent

92C—Vanstel loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,500 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Vanstel and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 5 inches; loam
 Bt-5 to 18 inches; clay loam
 Btk-18 to 24 inches; loam
 BC-24 to 60 inches; loam

Additional Components

Davidell and similar soils: 4 percent
 Gerdrum and similar soils: 4 percent
 Ivanell and similar soils: 3 percent
 Lonna and similar soils: 2 percent
 Vanstel and similar soils: 2 percent

93C—Telstad loam, 2 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,000 to 2,600 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description**Telstad and similar soils**

Composition: 85 percent
Geomorphic description: Alluvial fan, swale
Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches

Typical profile:

A-0 to 4 inches; loam
 Bt-4 to 13 inches; clay loam
 Bk1-13 to 22 inches; loam
 Bk2-22 to 60 inches; loam

Additional Components

Eapa and similar soils: 4 percent
 Hillon and similar soils: 4 percent
 Thoeny and similar soils: 4 percent
 Yamacall and similar soils: 3 percent

94B—Vaeda silty clay, 0 to 4 percent slopes**Map Unit Setting**

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,600 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description**Vaeda and similar soils**

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent

Surface layer texture: Silty clay

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Clayey alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 7.7 inches

Typical profile:

E-0 to 2 inches; silty clay

By-2 to 60 inches; silty clay

Additional Components

Gerdrum and similar soils: 8 percent

Marvan and similar soils: 7 percent

95C—Weingart clay, 2 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description**Weingart and similar soils**

Composition: 85 percent

Geomorphic description: Knoll, structural bench

Slope: 2 to 8 percent

Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from clayey shale
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches
Typical profile:
 E-0 to 2 inches; loam
 Btn-2 to 13 inches; clay
 Bkn-13 to 21 inches; clay
 Bnyz-21 to 35 inches; clay
 Cr-35 to 60 inches; bedrock

Additional Components

Neldore and similar soils: 5 percent
 Ralph and similar soils: 5 percent
 Gerdrum and similar soils: 3 percent
 Rock outcrop, soft: 2 percent

96B—Vanda silty clay, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Vanda and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 4 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Clayey alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.9 inches
Typical profile:
 E-0 to 2 inches; silty clay
 Byz-2 to 60 inches; silty clay

Additional Components

Gerdrum and similar soils: 8 percent

Marvan and similar soils: 7 percent

97D—Vendome sandy loam, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Vendome and similar soils

Composition: 85 percent

Geomorphic description: Stream terrace

Slope: 4 to 15 percent

Surface layer texture: Sandy loam

Depth to restrictive feature: None noted

Drainage class: Excessively drained

Parent material: Gravelly alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.7 inches

Typical profile:

A-0 to 9 inches; sandy loam

Bk-9 to 35 inches; very gravelly sandy loam

C-35 to 60 inches; very gravelly sand

Additional Components

Chinook and similar soils: 5 percent

Delpoint and similar soils: 5 percent

Eapa and similar soils: 5 percent

98B—Yamacall loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Yamacall and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; loam

Bw-4 to 11 inches; loam

Bk-11 to 48 inches; loam

C-48 to 60 inches; loam

Additional Components

Busby and similar soils: 4 percent

Delpoint and similar soils: 4 percent

Kobase and similar soils: 4 percent

Sonnett and similar soils: 3 percent

98C—Yamacall loam, 4 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Yamacall and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 4 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; loam

Bw-4 to 11 inches; loam

Bk-11 to 50 inches; loam

C-50 to 60 inches; loam

Additional Components

Busby and similar soils: 3 percent
Cabbart and similar soils: 2 percent
Cambeth and similar soils: 2 percent
Delpoint and similar soils: 2 percent
Kobase and similar soils: 2 percent
Rominell and similar soils: 2 percent
Twilight and similar soils: 2 percent

98D—Yamacall loam, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 16 inches
Frost-free period: 110 to 130 days

Component Description

Yamacall and similar soils

Composition: 85 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches
Typical profile:
A-0 to 4 inches; loam
Bw-4 to 11 inches; loam
Bk-11 to 50 inches; loam
C-50 to 60 inches; loam

Additional Components

Cabbart and similar soils: 4 percent
Rominell and similar soils: 4 percent
Twilight and similar soils: 4 percent
Fleak and similar soils: 3 percent

161B—Glendive sandy loam, saline, 0 to 4 percent slopes, occasionally flooded

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains

Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Glendive, saline and similar soils

Composition: 85 percent
Geomorphic description: Drainageway
Slope: 0 to 4 percent
Surface layer texture: Sandy loam
Depth to restrictive feature: None noted
Drainage class: Moderately well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Present
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.9 inches
Typical profile:
 A-0 to 4 inches; sandy loam
 C-4 to 60 inches; loam

Additional Components

Eapa and similar soils: 4 percent
 Glendive and similar soils: 3 percent
 Havre and similar soils: 3 percent
 Ismay and similar soils: 3 percent
 Hanly and similar soils: 2 percent

176F—Tinsley-Armells-Yamacall complex, 8 to 35 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,500 to 3,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Tinsley and similar soils

Composition: 40 percent
Geomorphic description: Stream terrace
Slope: 8 to 35 percent
Surface layer texture: Very gravelly sandy loam
Depth to restrictive feature: None noted
Drainage class: Excessively drained
Parent material: Gravelly alluvium
Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

Typical profile:

A-0 to 4 inches; very gravelly sandy loam

C-4 to 60 inches; very gravelly sand

Armells and similar soils

Composition: 30 percent

Geomorphic description: Terrace

Slope: 25 to 35 percent

Elevation: 2,500 to 3,300 feet

Effective annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Surface layer texture: Gravelly loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Colluvium derived from porcelanite

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.4 inches

Typical profile:

A-0 to 4 inches; gravelly loam

Bk-4 to 60 inches; extremely channery loam

Yamacall and similar soils

Composition: 20 percent

Geomorphic description: Hill

Slope: 8 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 5 inches; loam

Bw-5 to 12 inches; loam

Bk-12 to 50 inches; loam

C-50 to 60 inches; loam

Additional Components

Blacksheep and similar soils: 3 percent

Cabbart and similar soils: 3 percent

Twilight and similar soils: 3 percent

Busby and similar soils: 1 percent

201C—Abor silty clay, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Abor and similar soils

Composition: 85 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.9 inches
Typical profile:
 A-0 to 2 inches; silty clay
 Bss-2 to 11 inches; silty clay
 Bky-11 to 26 inches; silty clay
 Cr-26 to 60 inches; bedrock

Additional Components

Gerdrum and similar soils: 4 percent
 Marvan and similar soils: 4 percent
 Neldore and similar soils: 4 percent
 Vaeda and similar soils: 3 percent

203F—Neldore-Rock outcrop, soft-Bascovy complex, 15 to 45 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 2,600 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description

Neldore and similar soils

Composition: 40 percent
Geomorphic description: Hill
Slope: 25 to 45 percent
Surface layer texture: Clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches

Typical profile:

A-0 to 3 inches; clay

C-3 to 16 inches; clay

Cr-16 to 60 inches; bedrock

Rock outcrop, soft

Composition: 30 percent

Geomorphic description: None assigned

Bascom and similar soils

Composition: 20 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from clayey shale

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 3.5 inches

Typical profile:

A-0 to 2 inches; silty clay

Bss1-2 to 11 inches; silty clay

Bss2-11 to 23 inches; silty clay

Cr-23 to 60 inches; bedrock

Additional Components

Sunburst and similar soils: 5 percent

Yamacall and similar soils: 3 percent

Vanda and similar soils: 2 percent

204F—Neldore-Yamacall-Rock outcrop, soft, complex, 15 to 45 percent slopes**Map Unit Setting**

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 2,600 feet

Mean annual precipitation: 12 to 16 inches

Frost-free period: 110 to 130 days

Component Description**Neldore and similar soils**

Composition: 35 percent

Geomorphic description: Hill

Slope: 15 to 45 percent

Surface layer texture: Clay

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Clayey residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Typical profile:

A-0 to 3 inches; clay

C-3 to 16 inches; clay

Cr-16 to 60 inches; bedrock

Yamacall and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; loam

Bw-4 to 11 inches; loam

Bk-11 to 50 inches; loam

C-50 to 60 inches; loam

Rock outcrop, soft

Composition: 25 percent

Geomorphic description: None assigned

Additional Components

Bascovy and similar soils: 5 percent

Fleak and similar soils: 3 percent

Sunburst and similar soils: 2 percent

205D—Neldore-Bascovy complex, 2 to 15 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 2,600 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Neldore and similar soils

Composition: 40 percent

Geomorphic description: Knoll

Slope: 2 to 15 percent

Surface layer texture: Clay

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Clayey residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Typical profile:

A-0 to 3 inches; clay

C-3 to 16 inches; clay

Cr-16 to 60 inches; bedrock

Bascom and similar soils

Composition: 35 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from clayey shale

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 3.5 inches

Typical profile:

A-0 to 2 inches; silty clay

Bss1-2 to 11 inches; silty clay

Bss2-11 to 23 inches; silty clay

Cr-23 to 60 inches; bedrock

Additional Components

Vanda and similar soils: 9 percent

Rock outcrop, soft: 8 percent

Sunburst and similar soils: 8 percent

253E—Neldore-Volborg silty clays, 4 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,800 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Neldore and similar soils

Composition: 50 percent

Geomorphic description: Hill

Slope: 4 to 25 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Clayey residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

Typical profile:

A-0 to 2 inches; silty clay
 C-2 to 14 inches; clay
 Cr-14 to 60 inches; bedrock

Volborg and similar soils

Composition: 35 percent
Geomorphic description: Hill
Slope: 4 to 25 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

Typical profile:

A-0 to 2 inches; silty clay
 C-2 to 11 inches; silty clay
 Cr-11 to 60 inches; bedrock

Additional Components

Abor and similar soils: 4 percent
 Bullock and similar soils: 4 percent
 Vaeda and similar soils: 4 percent
 Rock outcrop, soft: 3 percent

291C—Brunelda-Gerdrum complex, 1 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,900 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description**Brunelda and similar soils**

Composition: 40 percent
Geomorphic description: Alluvial fan
Slope: 1 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium derived from shale
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 1 inch; silty clay
 Bw-1 to 5 inches; silty clay
 Byz1-5 to 12 inches; silty clay
 Byz2-12 to 48 inches; silty clay
 BC-48 to 60 inches; silty clay

Gerdrum and similar soils

Composition: 40 percent
Geomorphic description: Alluvial fan
Slope: 1 to 4 percent
Surface layer texture: Clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 6.2 inches

Typical profile:

Ap-0 to 5 inches; clay loam
 Btn-5 to 23 inches; silty clay loam
 Bknyz-23 to 25 inches; clay
 Bz-25 to 60 inches; clay loam

Additional Components

Absher and similar soils: 5 percent
 Bullock and similar soils: 5 percent
 Creed and similar soils: 5 percent
 Vaeda and similar soils: 5 percent

292C—Brunelda-Vaeda-Nobe complex, 1 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description**Brunelda and similar soils**

Composition: 35 percent
Geomorphic description: Alluvial fan
Slope: 1 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained

Parent material: Alluvium derived from shale

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 3.2 inches

Typical profile:

A-0 to 1 inch; silty clay

Bw-1 to 6 inches; silty clay

Byz1-6 to 13 inches; silty clay

Byz2-13 to 40 inches; silty clay

BC-40 to 60 inches; silty clay

Vaeda and similar soils

Composition: 30 percent

Geomorphic description: Alluvial fan

Slope: 1 to 4 percent

Surface layer texture: Silty clay

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Clayey alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 7.7 inches

Typical profile:

E-0 to 3 inches; silty clay

Bw-3 to 11 inches; silty clay

By-11 to 60 inches; silty clay

Nobe and similar soils

Composition: 25 percent

Geomorphic description: Alluvial fan

Slope: 1 to 8 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted

Drainage class: Moderately well drained

Parent material: Clayey alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 4.7 inches

Typical profile:

Ap-0 to 7 inches; silty clay loam

Byz-7 to 12 inches; silty clay

Bz-12 to 60 inches; silty clay

Additional Components

Bullock and similar soils: 5 percent

Gerdrum and similar soils: 5 percent

311D—Busby-Blacksheep-Twilight fine sandy loams, 2 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Busby and similar soils

Composition: 40 percent

Geomorphic description: Swale

Slope: 2 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.7 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bw-4 to 13 inches; fine sandy loam

Bk-13 to 47 inches; fine sandy loam

C-47 to 60 inches; loamy fine sand

Blacksheep and similar soils

Composition: 25 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.4 inches

Typical profile:

A-0 to 6 inches; fine sandy loam

Bk-6 to 16 inches; fine sandy loam

Cr-16 to 60 inches; bedrock

Twilight and similar soils

Composition: 20 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches
Typical profile:
 A-0 to 4 inches; fine sandy loam
 Bw-4 to 16 inches; fine sandy loam
 Bk-16 to 24 inches; fine sandy loam
 Cr-24 to 60 inches; bedrock

Additional Components

Delpoint and similar soils: 5 percent
 Yamacall and similar soils: 5 percent
 Rock outcrop, hard: 2 percent
 Yetull and similar soils: 2 percent
 Rock outcrop, soft: 1 percent

312F—Busby-Fleak complex, 15 to 45 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description

Busby and similar soils

Composition: 40 percent
Geomorphic description: Hill
Slope: 15 to 25 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium, eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches
Typical profile:
 A-0 to 5 inches; fine sandy loam
 Bw-5 to 11 inches; fine sandy loam
 Bk-11 to 47 inches; fine sandy loam
 C-47 to 60 inches; fine sandy loam

Fleak and similar soils

Composition: 40 percent
Geomorphic description: Hill
Slope: 15 to 45 percent
Surface layer texture: Loamy fine sand

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Somewhat excessively drained

Parent material: Residuum weathered from calcareous sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.3 inches

Typical profile:

A-0 to 7 inches; loamy fine sand

C-7 to 16 inches; loamy fine sand

Cr-16 to 60 inches; bedrock

Additional Components

Yamacall and similar soils: 8 percent

Sunburst and similar soils: 7 percent

Rock outcrop, soft: 3 percent

Rock outcrop, hard: 2 percent

313D—Busby-Twilight fine sandy loams, 2 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Busby and similar soils

Composition: 50 percent

Geomorphic description: Swale

Slope: 2 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.7 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bw-4 to 13 inches; fine sandy loam

Bk-13 to 47 inches; fine sandy loam

C-47 to 60 inches; loamy fine sand

Twilight and similar soils

Composition: 35 percent

Geomorphic description: Knoll

Slope: 2 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.5 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bw-4 to 16 inches; fine sandy loam

Bk-16 to 24 inches; fine sandy loam

Cr-24 to 60 inches; bedrock

Additional Components

Blacksheep and similar soils: 5 percent

Delpoint and similar soils: 5 percent

Yamacall and similar soils: 5 percent

314D—Busby-Twilight-Blacksheep fine sandy loams, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Busby and similar soils

Composition: 45 percent

Geomorphic description: Swale

Slope: 4 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.4 inches

Typical profile:

A-0 to 3 inches; fine sandy loam

Bw-3 to 17 inches; fine sandy loam

Bk-17 to 42 inches; fine sandy loam

C-42 to 60 inches; loamy fine sand

Twilight and similar soils

Composition: 25 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.1 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bw-4 to 12 inches; fine sandy loam

Bk-12 to 36 inches; fine sandy loam

Cr-36 to 60 inches; bedrock

Blacksheep and similar soils

Composition: 15 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.8 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bk-4 to 12 inches; fine sandy loam

Cr-12 to 60 inches; bedrock

Additional Components

Chinook and similar soils: 5 percent

Kremlin and similar soils: 5 percent

Yetull and similar soils: 5 percent

314E—Busby-Twilight-Blacksheep fine sandy loams, 8 to 35 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Busby and similar soils

Composition: 35 percent

Geomorphic description: Hill

Slope: 8 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.7 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bw-4 to 13 inches; fine sandy loam

Bk-13 to 47 inches; fine sandy loam

C-47 to 60 inches; loamy fine sand

Twilight and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 15 to 35 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.5 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bw-4 to 16 inches; fine sandy loam

Bk-16 to 24 inches; fine sandy loam

Cr-24 to 60 inches; bedrock

Blacksheep and similar soils

Composition: 20 percent

Geomorphic description: Hill

Slope: 8 to 35 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.4 inches

Typical profile:

A-0 to 6 inches; fine sandy loam

Bk-6 to 16 inches; fine sandy loam

Cr-16 to 60 inches; bedrock

Additional Components

Delpoint and similar soils: 5 percent

Yawdim and similar soils: 5 percent

Rock outcrop, hard: 3 percent

Rock outcrop, soft: 2 percent

314F—Busby-Yamacall-Fleak complex, 15 to 45 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Busby and similar soils

Composition: 35 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 inches

Typical profile:

A-0 to 5 inches; fine sandy loam

Bw-5 to 11 inches; fine sandy loam

Bk-11 to 47 inches; fine sandy loam

C-47 to 60 inches; fine sandy loam

Yamacall and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; loam

Bw-4 to 11 inches; loam

Bk-11 to 50 inches; loam

C-50 to 60 inches; loam

Fleak and similar soils

Composition: 25 percent

Geomorphic description: Hill

Slope: 15 to 45 percent

Surface layer texture: Loamy sand

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Somewhat excessively drained

Parent material: Residium weathered from calcareous sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

Typical profile:

A-0 to 7 inches; loamy sand

C-7 to 16 inches; loamy fine sand

Cr-16 to 60 inches; bedrock

Additional Components

Yetull and similar soils: 3 percent
Hillon and similar soils: 2 percent
Sunburst and similar soils: 2 percent
Kremlin and similar soils: 1 percent
Rock outcrop, hard: 1 percent
Rock outcrop, soft: 1 percent

316F—Twilight-Blacksheep fine sandy loams, 15 to 70 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Twilight and similar soils

Composition: 40 percent
Geomorphic description: Hill
Slope: 15 to 25 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches
Typical profile:
A-0 to 5 inches; fine sandy loam
Bw-5 to 11 inches; fine sandy loam
Bk-11 to 33 inches; fine sandy loam
Cr-33 to 60 inches; bedrock

Blacksheep and similar soils

Composition: 30 percent
Geomorphic description: Hill
Slope: 15 to 70 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches
Typical profile:
A-0 to 5 inches; fine sandy loam
Bk-5 to 12 inches; fine sandy loam
Cr-12 to 60 inches; bedrock

Additional Components

Busby and similar soils: 10 percent
Galbreth and similar soils: 10 percent
Yetull and similar soils: 5 percent
Rock outcrop, soft: 3 percent
Rock outcrop, hard: 2 percent

317C—Busby-Twilight-Blacksheep fine sandy loams, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Busby and similar soils

Composition: 35 percent
Geomorphic description: Swale
Slope: 2 to 8 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium, eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches
Typical profile:
A-0 to 6 inches; fine sandy loam
Bw-6 to 15 inches; fine sandy loam
Bk-15 to 46 inches; fine sandy loam
C-46 to 60 inches; loamy fine sand

Twilight and similar soils

Composition: 30 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches
Typical profile:
A-0 to 6 inches; fine sandy loam
Bw-6 to 22 inches; fine sandy loam
Bk-22 to 32 inches; fine sandy loam
Cr-32 to 60 inches; bedrock

Blacksheep and similar soils

Composition: 25 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches
Typical profile:
 A-0 to 6 inches; fine sandy loam
 Bk-6 to 17 inches; fine sandy loam
 Cr-17 to 60 inches; bedrock

Additional Components

Chinook and similar soils: 5 percent
 Yamacall and similar soils: 4 percent
 Rock outcrop, soft: 1 percent

318D—Busby-Twilight-Fleak complex, 8 to 15 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description**Busby and similar soils**

Composition: 40 percent
Geomorphic description: Swale
Slope: 8 to 15 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium, eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches
Typical profile:
 A-0 to 5 inches; fine sandy loam
 Bw-5 to 11 inches; fine sandy loam
 Bk-11 to 47 inches; fine sandy loam
 C-47 to 60 inches; fine sandy loam

Twilight and similar soils

Composition: 30 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches

Typical profile:

A-0 to 5 inches; fine sandy loam
 Bw-5 to 16 inches; fine sandy loam
 Bk-16 to 25 inches; fine sandy loam
 Cr-25 to 60 inches; bedrock

Fleak and similar soils

Composition: 20 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Loamy sand
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Somewhat excessively drained
Parent material: Residuum weathered from calcareous sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.2 inches

Typical profile:

A-0 to 7 inches; loamy sand
 C-7 to 16 inches; loamy fine sand
 Cr-16 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 3 percent
 Yamacall and similar soils: 3 percent
 Rominell and similar soils: 2 percent
 Rock outcrop, hard: 1 percent
 Rock outcrop, soft: 1 percent

319C—Busby-Twilight fine sandy loams, 2 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description

Busby and similar soils

Composition: 55 percent
Geomorphic description: Swale
Slope: 2 to 8 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium, eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches

Typical profile:

A-0 to 5 inches; fine sandy loam
 Bw-5 to 11 inches; fine sandy loam
 Bk-11 to 47 inches; fine sandy loam
 C-47 to 60 inches; fine sandy loam

Twilight and similar soils

Composition: 30 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches

Typical profile:

A-0 to 5 inches; fine sandy loam
 Bw-5 to 16 inches; fine sandy loam
 Bk-16 to 25 inches; fine sandy loam
 Cr-25 to 60 inches; bedrock

Additional Components

Chinook and similar soils: 5 percent
 Fleak and similar soils: 4 percent
 Cabbart and similar soils: 3 percent
 Rominell and similar soils: 3 percent

319E—Busby-Twilight-Blacksheep fine sandy loams, 8 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Busby and similar soils

Composition: 35 percent

Geomorphic description: Hill

Slope: 8 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 inches

Typical profile:

A-0 to 3 inches; fine sandy loam

Bw-3 to 15 inches; fine sandy loam

Bk-15 to 47 inches; fine sandy loam

C-47 to 60 inches; fine sandy loam

Twilight and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 8 to 25 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.1 inches

Typical profile:

A-0 to 3 inches; fine sandy loam

Bw-3 to 15 inches; fine sandy loam

Bk-15 to 28 inches; fine sandy loam

Cr-28 to 60 inches; bedrock

Blacksheep and similar soils

Composition: 25 percent

Geomorphic description: Hill

Slope: 8 to 25 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.2 inches

Typical profile:

A-0 to 2 inches; fine sandy loam

Bk-2 to 15 inches; fine sandy loam

Cr-15 to 60 inches; bedrock

Additional Components

Chinook and similar soils: 3 percent
Yamacall and similar soils: 3 percent
Yetull and similar soils: 3 percent
Rock outcrop, hard: 1 percent

323C—Bullock, thin surface-Rominell complex, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Bullock and similar soils

Composition: 40 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Clay loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.5 inches
Typical profile:
E-0 to 7 inches; clay loam
Btn-7 to 14 inches; clay loam
Bkz-14 to 28 inches; sandy clay loam
Cr-28 to 60 inches; bedrock

Rominell and similar soils

Composition: 35 percent
Geomorphic description: Swale
Slope: 2 to 8 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.4 inches
Typical profile:
A-0 to 4 inches; fine sandy loam
E-4 to 8 inches; fine sandy loam

Btn-8 to 13 inches; clay loam
Byz-13 to 60 inches; clay loam

Additional Components

Bullock and similar soils: 5 percent
Chinook, alkali substratum and similar soils: 5 percent
Ralore and similar soils: 5 percent
Rominell and similar soils: 5 percent
Slickspots and similar soils: 5 percent

352F—Cabbart-Twilight complex, 15 to 45 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 16 inches
Frost-free period: 110 to 130 days

Component Description

Cabbart and similar soils

Composition: 40 percent
Geomorphic description: Hill
Slope: 15 to 45 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches
Typical profile:
A-0 to 4 inches; silt loam
Bk-4 to 13 inches; loam
Cr-13 to 60 inches; bedrock

Twilight and similar soils

Composition: 35 percent
Geomorphic description: Hill
Slope: 15 to 25 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches
Typical profile:
A-0 to 5 inches; fine sandy loam
Bw-5 to 16 inches; fine sandy loam
Bk-16 to 25 inches; fine sandy loam
Cr-25 to 60 inches; bedrock

Additional Components

Fleak and similar soils: 7 percent
Busby and similar soils: 5 percent
Rock outcrop, soft: 5 percent
Yawdim and similar soils: 5 percent
Yamacall and similar soils: 3 percent

353D—Cabbart-Yawdim complex, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description

Cabbart and similar soils

Composition: 55 percent
Geomorphic description: Knoll
Slope: 4 to 15 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches
Typical profile:
A-0 to 4 inches; silt loam
Bk-4 to 13 inches; loam
Cr-13 to 60 inches; bedrock

Yawdim and similar soils

Composition: 35 percent
Geomorphic description: Knoll
Slope: 4 to 15 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale and siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches
Typical profile:
A-0 to 6 inches; silty clay
C-6 to 15 inches; silty clay loam
Cr-15 to 60 inches; bedrock

Additional Components

Twilight and similar soils: 4 percent
Cambeth and similar soils: 3 percent
Yamacall and similar soils: 3 percent

354C—Cambeth silt loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description

Cambeth and similar soils

Composition: 80 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.2 inches
Typical profile:
A-0 to 6 inches; silt loam
Bw-6 to 11 inches; silt loam
Bk-11 to 35 inches; silt loam
Cr-35 to 60 inches; bedrock

Additional Components

Floweree and similar soils: 6 percent
Lonna and similar soils: 6 percent
Yawdim and similar soils: 5 percent
Busby and similar soils: 3 percent

362F—Cabbart-Rock outcrop, soft-Delpoint complex, 15 to 50 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Cabbart and similar soils

Composition: 45 percent
Geomorphic description: Hill
Slope: 15 to 50 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches
Typical profile:
 A-0 to 3 inches; loam
 Bk-3 to 12 inches; silt loam
 BC-12 to 17 inches; loam
 Cr-17 to 60 inches; bedrock

Rock outcrop, soft

Composition: 30 percent
Geomorphic description: Hill

Delpoint and similar soils

Composition: 15 percent
Geomorphic description: Hill
Slope: 15 to 35 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum, loamy colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches
Typical profile:
 A-0 to 3 inches; loam
 Bw-3 to 12 inches; loam
 Bk-12 to 28 inches; loam
 Cr-28 to 60 inches; bedrock

Additional Components

Twilight and similar soils: 4 percent
 Mego not and similar soils: 3 percent
 Yawdim and similar soils: 3 percent

368F—Cabbart-Rock outcrop, soft, complex, 15 to 45 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Cabbart and similar soils

Composition: 34 percent

Geomorphic description: Hill

Slope: 15 to 45 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Typical profile:

A-0 to 4 inches; silt loam

Bk-4 to 13 inches; loam

Cr-13 to 60 inches; bedrock

Rock outcrop, soft

Composition: 36 percent

Geomorphic description: None assigned

Additional Components

Yawdim and similar soils: 9 percent

Kirby and similar soils: 8 percent

Yamacall and similar soils: 6 percent

Busby and similar soils: 4 percent

Gerdrum and similar soils: 3 percent

369F—Cabbart-Rock outcrop, soft-Yawdim complex, 15 to 70 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Cabbart and similar soils

Composition: 35 percent

Geomorphic description: Hill

Slope: 15 to 70 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.9 inches

Typical profile:

A-0 to 3 inches; loam

Bk-3 to 7 inches; loam

BC-7 to 17 inches; loam

Cr-17 to 60 inches; bedrock

Rock outcrop, soft

Composition: 30 percent

Geomorphic description: None assigned

Yawdim and similar soils

Composition: 20 percent

Geomorphic description: Hill

Slope: 15 to 70 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from clayey shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Typical profile:

A-0 to 3 inches; silty clay loam

C-3 to 18 inches; silty clay

Cr-18 to 60 inches; bedrock

Additional Components

Busby and similar soils: 3 percent

Cambeth and similar soils: 3 percent

Delpoint and similar soils: 3 percent

Kobase and similar soils: 3 percent

Lonna and similar soils: 3 percent

371F—Cambeth-Cabbart-Rock outcrop, soft, complex, 8 to 45 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Cambeth and similar soils

Composition: 35 percent

Geomorphic description: Hill

Slope: 8 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock

Cabbart and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 8 to 45 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 3 inches; silt loam

Bk-3 to 12 inches; silt loam

BC-12 to 17 inches; loam

Cr-17 to 60 inches; bedrock

Rock outcrop, soft

Composition: 20 percent

Geomorphic description: None assigned

Additional Components

Blacksheep and similar soils: 3 percent

Lonna and similar soils: 3 percent

Megonot and similar soils: 3 percent

Twilight and similar soils: 3 percent

Yawdim and similar soils: 3 percent

372E—Lonna-Cambeth-Cabbart silt loams, 12 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Lonna and similar soils

Composition: 40 percent
Geomorphic description: Swale
Slope: 12 to 15 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 3 inches; silt loam
Bw-3 to 10 inches; silt loam
Bk-10 to 30 inches; silt loam
BC-30 to 60 inches; silty clay loam

Cambeth and similar soils

Composition: 25 percent
Geomorphic description: Hill
Slope: 15 to 25 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam
Bw-3 to 11 inches; silt loam
Bk-11 to 32 inches; silt loam
Cr-32 to 60 inches; bedrock

Cabbart and similar soils

Composition: 20 percent
Geomorphic description: Hill
Slope: 12 to 25 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 3 inches; silt loam
Bk-3 to 12 inches; silt loam
BC-12 to 17 inches; loam
Cr-17 to 60 inches; bedrock

Additional Components

Busby and similar soils: 3 percent
Floweree and similar soils: 3 percent
Kobase and similar soils: 3 percent
Blacksheep and similar soils: 2 percent
Rock outcrop, soft: 2 percent
Yawdim and similar soils: 2 percent

373C—Cambeth, noncalcareous-Megonot complex, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Cambeth, noncalcareous and similar soils

Composition: 45 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches
Typical profile:
A-0 to 3 inches; silt loam
Bw-3 to 11 inches; silt loam
Bk-11 to 32 inches; silt loam
Cr-32 to 60 inches; bedrock

Megonot and similar soils

Composition: 40 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale and siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.6 inches

Typical profile:

A-0 to 4 inches; silty clay loam
 Bw-4 to 12 inches; silty clay loam
 Bk-12 to 18 inches; silty clay loam
 By-18 to 28 inches; silty clay loam
 Cr-28 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 3 percent
 Cambeth and similar soils: 2 percent
 Kobase and similar soils: 2 percent
 Lonna and similar soils: 2 percent
 Twilight and similar soils: 2 percent
 Yamacall and similar soils: 2 percent
 Yawdim and similar soils: 2 percent

373D—Cambeth, noncalcareous-Megonot complex, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description**Cambeth, noncalcareous and similar soils**

Composition: 45 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam
 Bw-3 to 11 inches; silt loam
 Bk-11 to 32 inches; silt loam
 Cr-32 to 60 inches; bedrock

Megonot and similar soils

Composition: 40 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained

Parent material: Clayey residuum weathered from shale and siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.6 inches

Typical profile:

A-0 to 4 inches; silty clay loam

Bw-4 to 12 inches; silty clay loam

Bk-12 to 18 inches; silty clay loam

By-18 to 28 inches; silty clay loam

Cr-28 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 3 percent

Kobase and similar soils: 3 percent

Lonna and similar soils: 3 percent

Twilight and similar soils: 2 percent

Yamacall and similar soils: 2 percent

Yawdim and similar soils: 2 percent

374E—Cambeth-Cabbart-Yawdim complex, 15 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Cambeth and similar soils

Composition: 35 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock

Cabbart and similar soils

Composition: 25 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches
Typical profile:
 A-0 to 3 inches; silt loam
 Bk-3 to 12 inches; silt loam
 BC-12 to 17 inches; loam
 Cr-17 to 60 inches; bedrock

Yawdim and similar soils

Composition: 25 percent
Geomorphic description: Hill
Slope: 15 to 25 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale and siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.1 inches
Typical profile:
 A-0 to 3 inches; silty clay loam
 C-3 to 18 inches; silty clay loam
 Cr-18 to 60 inches; bedrock

Additional Components

Lonna and similar soils: 5 percent
 Magonot and similar soils: 5 percent
 Rock outcrop, soft: 5 percent

375D—Cambeth-Twilight-Cabbart complex, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Cambeth and similar soils

Composition: 40 percent
Geomorphic description: Knoll
Slope: 4 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock

Twilight and similar soils

Composition: 30 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

Typical profile:

A-0 to 5 inches; fine sandy loam

Bw-5 to 25 inches; fine sandy loam

Bk-25 to 29 inches; fine sandy loam

Cr-29 to 60 inches; bedrock

Cabbart and similar soils

Composition: 20 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 3 inches; silt loam

Bk-3 to 12 inches; silt loam

BC-12 to 17 inches; loam

Cr-17 to 60 inches; bedrock

Additional Components

Blacksheep and similar soils: 3 percent

Yamacall and similar soils: 3 percent

Cabbart, moist and similar soils: 2 percent

Yawdim and similar soils: 2 percent

376C—Cambeth-Cabbart silt loams, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Cambeth and similar soils

Composition: 45 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock

Cabbart and similar soils

Composition: 40 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.2 inches

Typical profile:

A-0 to 3 inches; silt loam

Bk1-3 to 7 inches; silt loam

Bk2-7 to 18 inches; loam

Cr-18 to 60 inches; bedrock

Additional Components

Lonna and similar soils: 4 percent

Megonot and similar soils: 4 percent

Yawdim and similar soils: 4 percent

Twilight and similar soils: 3 percent

376D—Cambeth-Cabbart silt loams, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Cambeth and similar soils

Composition: 55 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.4 inches

Typical profile:

A-0 to 5 inches; silt loam

Bw-5 to 22 inches; silt loam

Bk-22 to 30 inches; silt loam

Cr-30 to 60 inches; bedrock

Cabbart and similar soils

Composition: 30 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.2 inches

Typical profile:

A-0 to 7 inches; silt loam

Bk-7 to 12 inches; silt loam

Cr-12 to 60 inches; bedrock

Additional Components

Kobase and similar soils: 4 percent

Lonna and similar soils: 4 percent

Yamacall and similar soils: 4 percent

Yawdim and similar soils: 3 percent

376E—Cambeth-Cabbart-Yawdim complex, 4 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,140 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Cambeth and similar soils

Composition: 40 percent
Geomorphic description: Hill
Slope: 4 to 15 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches
Typical profile:
A-0 to 5 inches; silt loam
Bw-5 to 15 inches; silt loam
Bk-15 to 28 inches; silt loam
Cr-28 to 60 inches; bedrock

Cabbart and similar soils

Composition: 25 percent
Geomorphic description: Hill
Slope: 4 to 25 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches
Typical profile:
A-0 to 4 inches; silt loam
Bk-4 to 17 inches; loam
Cr-17 to 60 inches; bedrock

Yawdim and similar soils

Composition: 20 percent
Geomorphic description: Hill
Slope: 4 to 15 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained

Parent material: Residuum weathered from shale and siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.5 inches

Typical profile:

A-0 to 4 inches; silty clay loam

C-4 to 14 inches; silty clay loam

Cr-14 to 60 inches; bedrock

Additional Components

Abor and similar soils: 6 percent

Lonna and similar soils: 6 percent

Rock outcrop, soft: 3 percent

377D—Cambeth-Cabbart-Kirby complex, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Cambeth and similar soils

Composition: 35 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock

Cabbart and similar soils

Composition: 25 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 3 inches; silt loam

Bk-3 to 12 inches; silt loam

BC-12 to 17 inches; loam

Cr-17 to 60 inches; bedrock

Kirby and similar soils

Composition: 20 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Channery loam

Depth to restrictive feature: None noted

Drainage class: Excessively drained

Parent material: Residuum weathered from porcelanite

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.5 inches

Typical profile:

A-0 to 4 inches; channery loam

Bk-4 to 12 inches; extremely channery loam

2C-12 to 60 inches; channers

Additional Components

Floweree and similar soils: 5 percent

Lonna and similar soils: 5 percent

Twilight and similar soils: 4 percent

Megonot and similar soils: 3 percent

Yawdim and similar soils: 3 percent

377E—Cambeth-Cabbart-Kirby complex, 8 to 45 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Cambeth and similar soils

Composition: 35 percent

Geomorphic description: Hill

Slope: 8 to 25 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 39 inches

Drainage class: Well drained

Parent material: Residuum weathered from siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock

Cabbart and similar soils

Composition: 25 percent

Geomorphic description: Hill

Slope: 8 to 45 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 3 inches; loam

Bk-3 to 12 inches; silt loam

BC-12 to 17 inches; loam

Cr-17 to 60 inches; bedrock

Kirby and similar soils

Composition: 20 percent

Geomorphic description: Hill

Slope: 8 to 45 percent

Surface layer texture: Channery loam

Depth to restrictive feature: None noted

Drainage class: Excessively drained

Parent material: Residuum weathered from porcelanite

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.5 inches

Typical profile:

A-0 to 4 inches; channery loam

Bk-4 to 12 inches; very channery loam

2C-12 to 60 inches; channers

Additional Components

Floweree and similar soils: 5 percent

Lonna and similar soils: 5 percent

Megonot and similar soils: 3 percent

Yawdim and similar soils: 3 percent

Rock outcrop, hard: 2 percent

Twilight and similar soils: 2 percent

378C—Cambeth silt loam, cool, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Cambeth and similar soils

Composition: 85 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.3 inches

Typical profile:

A-0 to 5 inches; silt loam

Bw-5 to 12 inches; silt loam

Bk-12 to 36 inches; silt loam

Cr-36 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 8 percent

Lonna and similar soils: 7 percent

379D—Cambeth-Cabbart silt loams, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 16 inches

Frost-free period: 110 to 130 days

Component Description

Cambeth and similar soils

Composition: 50 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

Typical profile:

A-0 to 6 inches; silt loam

Bw-6 to 11 inches; silt loam

Bk-11 to 35 inches; silt loam

Cr-35 to 60 inches; bedrock

Cabbart and similar soils

Composition: 35 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 4 inches; silt loam

Bk1-4 to 13 inches; silt loam

Bk2-13 to 17 inches; loam

Cr-17 to 60 inches; bedrock

Additional Components

Yawdim and similar soils: 5 percent

Yamacall and similar soils: 4 percent

Busby and similar soils: 3 percent

Fleak and similar soils: 3 percent

379E—Cambeth-Cabbart complex, 8 to 25 percent slopes, dissected

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,600 to 3,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Cambeth and similar soils

Composition: 45 percent

Geomorphic description: Hill

Slope: 8 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 10 inches; silt loam

Bk-10 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock

Cabbart and similar soils

Composition: 40 percent

Geomorphic description: Hill

Slope: 8 to 25 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

Typical profile:

A-0 to 3 inches; loam

Bk-3 to 14 inches; silt loam

Cr-14 to 60 inches; bedrock

Additional Components

Lonna and similar soils: 4 percent

Yamacall and similar soils: 4 percent

Yawdim and similar soils: 4 percent

Rock outcrop, soft: 3 percent

381C—Chinook-Kremlin complex, 2 to 6 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost free period: 105 to 135 days

Component Description

Chinook and similar soils

Composition: 50 percent

Geomorphic description: Alluvial fan

Slope: 2 to 6 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.4 inches

Typical profile:

A-0 to 14 inches; fine sandy loam

Bw-14 to 24 inches; fine sandy loam

Bk-24 to 60 inches; fine sandy loam

Kremlin and similar soils

Composition: 40 percent

Geomorphic description: Alluvial fan

Slope: 2 to 6 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.3 inches

Typical profile:

A-0 to 8 inches; loam

Bw-8 to 14 inches; loam

Bk-14 to 40 inches; loam

BC-40 to 60 inches; stratified sandy loam to silt loam

Additional Components

Delpoint and similar soils: 5 percent

Twilight and similar soils: 5 percent

382D—Chinook-Twilight fine sandy loams, 2 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Chinook and similar soils

Composition: 50 percent

Geomorphic description: Knoll

Slope: 2 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.4 inches

Typical profile:

A-0 to 14 inches; fine sandy loam

Bw-14 to 24 inches; fine sandy loam

Bk-24 to 60 inches; fine sandy loam

Twilight and similar soils

Composition: 40 percent

Geomorphic description: Knoll

Slope: 2 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.5 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bw-4 to 16 inches; fine sandy loam

Bk-16 to 24 inches; fine sandy loam

Cr-24 to 60 inches; bedrock

Additional Components

Blacksheep and similar soils: 3 percent

Eapa and similar soils: 3 percent

Delpoint and similar soils: 2 percent

Yetull and similar soils: 2 percent

383C—Chinook-Twilight-Eapa complex, 2 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description**Chinook and similar soils**

Composition: 35 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.4 inches

Typical profile:

A-0 to 14 inches; fine sandy loam

Bw-14 to 24 inches; fine sandy loam

Bk-24 to 60 inches; fine sandy loam

Twilight and similar soils*Composition:* 30 percent*Geomorphic description:* Knoll*Slope:* 2 to 8 percent*Surface layer texture:* Fine sandy loam*Depth to restrictive feature:* Bedrock (paralithic): 20 to 40 inches*Drainage class:* Well drained*Parent material:* Residuum weathered from sandstone*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 3.5 inches**Typical profile:**

A-0 to 4 inches; fine sandy loam

Bw-4 to 16 inches; fine sandy loam

Bk-16 to 24 inches; fine sandy loam

Cr-24 to 60 inches; bedrock

Eapa and similar soils*Composition:* 20 percent*Geomorphic description:* Swale*Slope:* 2 to 6 percent*Surface layer texture:* Loam*Depth to restrictive feature:* None noted*Drainage class:* Well drained*Parent material:* Loamy alluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.6 inches**Typical profile:**

A-0 to 8 inches; loam

Bt-8 to 24 inches; clay loam

Bk-24 to 60 inches; clay loam

Additional Components

Blacksheep and similar soils: 5 percent

Delpoint and similar soils: 5 percent

Ethridge and similar soils: 5 percent

385B—Chinook fine sandy loam, 0 to 4 percent slopes**Map Unit Setting***Interpretive focus:* Cropland, rangeland*Field investigation intensity:* Order 2*Landscape:* Plains*Elevation:* 1,900 to 3,620 feet*Mean annual precipitation:* 12 to 14 inches*Frost-free period:* 110 to 130 days

Component Description

Chinook and similar soils

Composition: 90 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.7 inches

Typical profile:

A-0 to 6 inches; fine sandy loam

Bw-6 to 29 inches; fine sandy loam

Bk-29 to 60 inches; fine sandy loam

Additional Components

Floweree and similar soils: 4 percent

Yamacall and similar soils: 4 percent

Rominell and similar soils: 2 percent

385C—Chinook fine sandy loam, 4 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 16 inches

Frost-free period: 110 to 130 days

Component Description

Chinook and similar soils

Composition: 90 percent

Geomorphic description: Alluvial fan

Slope: 4 to 8 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.7 inches

Typical profile:

A-0 to 6 inches; fine sandy loam

Bw-6 to 29 inches; fine sandy loam

Bk-29 to 60 inches; fine sandy loam

Additional Components

Fleak and similar soils: 4 percent
Yamacall and similar soils: 3 percent
Floweree and similar soils: 2 percent
Rominell and similar soils: 1 percent

385D—Chinook fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 16 inches
Frost-free period: 110 to 130 days

Component Description

Chinook and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 8 to 15 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium, eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.7 inches

Typical profile:

A-0 to 6 inches; fine sandy loam
Bw-6 to 29 inches; fine sandy loam
Bk-29 to 60 inches; fine sandy loam

Additional Components

Busby and similar soils: 4 percent
Fleak and similar soils: 4 percent
Kremlin and similar soils: 4 percent
Yamacall and similar soils: 3 percent

386C—Chinook fine sandy loam, alkali substratum, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Chinook, alkali substratum and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.0 inches

Typical profile:

A-0 to 3 inches; fine sandy loam

Bw-3 to 12 inches; fine sandy loam

Bk-12 to 40 inches; fine sandy loam

BC1-40 to 52 inches; fine sandy loam

BC2-52 to 60 inches; loam

Additional Components

Chinook and similar soils: 5 percent

Rominell and similar soils: 5 percent

Twilight and similar soils: 4 percent

Rock outcrop, soft: 1 percent

391C—Creed-Gerdrum complex, 0 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 16 inches

Frost-free period: 110 to 130 days

Component Description

Creed and similar soils

Composition: 50 percent

Geomorphic description: Alluvial fan

Slope: 0 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.7 inches

Typical profile:

A-0 to 8 inches; loam

Btn-8 to 24 inches; silty clay

Bky-24 to 60 inches; silty clay loam

Gerdrum and similar soils*Composition:* 35 percent*Geomorphic description:* Alluvial fan, stream terrace*Slope:* 0 to 8 percent*Surface layer texture:* Clay loam*Depth to restrictive feature:* None noted*Drainage class:* Well drained*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:* Mainly 5.9 inches**Typical profile:**

Ap-0 to 7 inches; clay loam

Btn-7 to 11 inches; silty clay loam

Bknyz-11 to 25 inches; clay

Bz-25 to 60 inches; clay loam

Additional Components

Absher and similar soils: 5 percent

Thoeny and similar soils: 5 percent

Fleak and similar soils: 3 percent

Kremlin and similar soils: 2 percent

411B—Davidell-Antwerp silty clay loams, 0 to 4 percent slopes**Map Unit Setting***Interpretive focus:* Cropland, rangeland*Field investigation intensity:* Order 2*Landscape:* Plains*Elevation:* 2,600 to 3,500 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 115 to 130 days**Component Description****Davidell and similar soils***Composition:* 55 percent*Geomorphic description:* Alluvial fan, stream terrace*Slope:* 0 to 4 percent*Surface layer texture:* Silty clay loam*Depth to restrictive feature:* None noted*Drainage class:* Well drained*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: Mainly 6.9 inches

Typical profile:

E-0 to 7 inches; silty clay loam
 Bt-7 to 17 inches; clay loam
 Bk-17 to 28 inches; clay loam
 Byz-28 to 60 inches; silty clay loam

Antwerp and similar soils

Composition: 30 percent
Geomorphic description: Micro-low on alluvial fan, micro-low on stream terrace
Slope: 0 to 4 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 6.3 inches
Typical profile:
 A-0 to 7 inches; silty clay loam
 Bz-7 to 24 inches; silty clay loam
 BC-24 to 60 inches; silt loam

Additional Components

Alona and similar soils: 8 percent
 Gerdrum and similar soils: 7 percent

413C—Davidell-Ivanell complex, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Davidell and similar soils

Composition: 40 percent
Geomorphic description: Swale
Slope: 2 to 4 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 6.7 inches

Typical profile:

E-0 to 4 inches; loam
 Bt-4 to 9 inches; clay loam
 Bk-9 to 25 inches; clay loam
 Byz-25 to 60 inches; silty clay loam

Ivanell and similar soils

Composition: 40 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.5 inches
Typical profile:
 Ap-0 to 7 inches; silty clay loam
 Bk-7 to 16 inches; silty clay loam
 BC-16 to 30 inches; clay loam
 Cr-30 to 60 inches; bedrock

Additional Components

Cambeth and similar soils: 4 percent
 Delpoint and similar soils: 4 percent
 Gerdrum and similar soils: 4 percent
 Antwerp and similar soils: 3 percent
 Niler and similar soils: 3 percent
 Sumatra and similar soils: 2 percent

414C—Rahworth-Davidell-Sumatra complex, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Rahworth and similar soils

Composition: 40 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Clay loam

Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 5.3 inches
Typical profile:
 Ap-0 to 7 inches; clay loam
 Bw-7 to 11 inches; clay loam
 Bk-11 to 23 inches; silty clay loam
 Byz-23 to 42 inches; silty clay loam
 Bz-42 to 60 inches; silty clay loam

Davidell and similar soils

Composition: 35 percent
Geomorphic description: Alluvial fan
Slope: 2 to 4 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.2 inches
Typical profile:
 E-0 to 6 inches; silt loam
 Bt-6 to 11 inches; clay loam
 Bk-11 to 32 inches; clay loam
 Byz-32 to 60 inches; silty clay loam

Sumatra and similar soils

Composition: 15 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 3.9 inches
Typical profile:
 A-0 to 3 inches; silty clay loam
 By-3 to 11 inches; silty clay loam
 BC-11 to 29 inches; silty clay loam
 C-29 to 60 inches; silty clay loam

Additional Components

Ivanell and similar soils: 5 percent
 Niler and similar soils: 5 percent

415B—Davidell loam, 2 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,600 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Davidell and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 2 to 4 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.9 inches

Typical profile:

Ap-0 to 8 inches; loam

Bk-8 to 30 inches; clay loam

Bky-30 to 60 inches; loam

Additional Components

Alona and similar soils: 4 percent

Antwerp and similar soils: 3 percent

Cambeth, noncalcareous and similar soils: 2 percent

Davidell and similar soils: 2 percent

Gerdrum and similar soils: 2 percent

Vanstel and similar soils: 2 percent

416C—Rahworth loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Rahworth and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 5.4 inches

Typical profile:

E-0 to 3 inches; loam
 Bw-3 to 8 inches; clay loam
 Bk-8 to 23 inches; silty clay loam
 Byz-23 to 36 inches; silty clay loam
 Bz-36 to 60 inches; silty clay loam

Additional Components

Davidell and similar soils: 8 percent
 Sumatra and similar soils: 7 percent

431E—Delpoint-Yamacall-Cabbart loams, 8 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,140 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Delpoint and similar soils

Composition: 35 percent
Geomorphic description: Hill
Slope: 15 to 25 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches
Typical profile:
 A-0 to 3 inches; loam
 Bw-3 to 12 inches; loam
 Bk-12 to 28 inches; loam
 Cr-28 to 60 inches; bedrock

Yamacall and similar soils

Composition: 30 percent
Geomorphic description: Swale
Slope: 8 to 15 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; loam
 Bw-4 to 11 inches; loam
 Bk-11 to 48 inches; loam
 C-48 to 60 inches; loam

Cabbart and similar soils

Composition: 20 percent
Geomorphic description: Hill
Slope: 15 to 25 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 3 inches; loam
 Bk-3 to 12 inches; silt loam
 BC-12 to 17 inches; loam
 Cr-17 to 60 inches; bedrock

Additional Components

Busby and similar soils: 3 percent
 Sonnett and similar soils: 3 percent
 Magonot and similar soils: 2 percent
 Rock outcrop, soft: 2 percent
 Twilight and similar soils: 2 percent
 Yawdim and similar soils: 2 percent
 Rock outcrop, hard: 1 percent

432F—Delpoint-Cabbart-Yawdim complex, 25 to 70 percent slopes**Map Unit Setting**

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Delpoint and similar soils

Composition: 35 percent
Geomorphic description: Hill
Slope: 25 to 70 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.2 inches
Typical profile:
A-0 to 5 inches; loam
Bw-5 to 12 inches; loam
Bk-12 to 32 inches; loam
Cr-32 to 60 inches; bedrock

Cabbart and similar soils

Composition: 25 percent
Geomorphic description: Hill
Slope: 25 to 70 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches
Typical profile:
A-0 to 3 inches; loam
Bk-3 to 13 inches; loam
Cr-13 to 60 inches; bedrock

Yawdim and similar soils

Composition: 20 percent
Geomorphic description: Hill
Slope: 25 to 70 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale and siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches
Typical profile:
A-0 to 2 inches; silty clay loam
C-2 to 11 inches; silty clay loam
Cr-11 to 60 inches; bedrock

Additional Components

Cambeth and similar soils: 5 percent
Kobase and similar soils: 5 percent
Lonna and similar soils: 4 percent

Yamacall and similar soils: 4 percent

Rock outcrop, soft: 2 percent

433C—Delpoint-Galbreth complex, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,700 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Delpoint and similar soils

Composition: 50 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

Typical profile:

A-0 to 8 inches; loam

Bw-8 to 12 inches; loam

Bk-12 to 37 inches; loam

Cr-37 to 60 inches; bedrock

Galbreth and similar soils

Composition: 35 percent

Geomorphic description: Knoll

Slope: 2 to 4 percent

Surface layer texture: Sandy clay loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

Typical profile:

A-0 to 8 inches; sandy clay loam

Bw-8 to 11 inches; sandy clay loam

Cr-11 to 60 inches; bedrock

Additional Components

Lonna and similar soils: 4 percent

Vanstel and similar soils: 4 percent

Yamacall and similar soils: 4 percent

Cambeth and similar soils: 3 percent

434D—Delpoint-Busby-Blacksheep complex, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,620 feet

Mean annual precipitation: 10 to 12 inches

Frost-free period: 110 to 130 days

Component Description

Delpoint and similar soils

Composition: 35 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

Typical profile:

A-0 to 3 inches; loam

Bw-3 to 14 inches; loam

Bk-14 to 26 inches; loam

Cr-26 to 60 inches; bedrock

Busby and similar soils

Composition: 30 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 inches

Typical profile:

A-0 to 5 inches; fine sandy loam

Bw-5 to 13 inches; fine sandy loam

Bk-13 to 47 inches; fine sandy loam

C-47 to 60 inches; fine sandy loam

Blacksheep and similar soils

Composition: 20 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.7 inches

Typical profile:

A-0 to 5 inches; fine sandy loam

Bk-5 to 18 inches; fine sandy loam

Cr-18 to 60 inches; bedrock

Additional Components

Chinook and similar soils: 5 percent

Yamacall and similar soils: 5 percent

Yetull and similar soils: 5 percent

435E—Delpoint-Cabbart-Yawdim complex, 4 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Delpoint and similar soils

Composition: 45 percent

Geomorphic description: Hill

Slope: 4 to 25 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 39 inches

Drainage class: Well drained

Parent material: Residuum weathered from siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.4 inches

Typical profile:

A-0 to 5 inches; loam

Bw-5 to 14 inches; loam

Bk-14 to 27 inches; loam

Cr-27 to 60 inches; bedrock

Cabbart and similar soils

Composition: 25 percent

Geomorphic description: Hill

Slope: 4 to 25 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 4 inches; silt loam

Bk-4 to 17 inches; loam

Cr-17 to 60 inches; bedrock

Yawdim and similar soils

Composition: 15 percent

Geomorphic description: Hill

Slope: 4 to 25 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from clayey shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

Typical profile:

A-0 to 4 inches; silty clay loam

C-4 to 11 inches; silty clay

Cr-11 to 60 inches; bedrock

Additional Components

Busby and similar soils: 3 percent

Gerdrum and similar soils: 3 percent

Kobase and similar soils: 3 percent

Neldore and similar soils: 3 percent

Yamacall and similar soils: 2 percent

Rock outcrop, soft: 1 percent

437D—Delpoint-Cabbart loams, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,620 feet

Mean annual precipitation: 10 to 12 inches

Frost-free period: 110 to 130 days

Component Description

Delpoint and similar soils

Composition: 60 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.7 inches

Typical profile:

A-0 to 3 inches; loam

Bw-3 to 14 inches; loam

Bk-14 to 35 inches; loam

Cr-35 to 60 inches; bedrock

Cabbart and similar soils

Composition: 30 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.2 inches

Typical profile:

A-0 to 4 inches; loam

Bk-4 to 18 inches; loam

Cr-18 to 60 inches; bedrock

Additional Components

Blacksheep and similar soils: 3 percent

Busby and similar soils: 3 percent

Rock outcrop, soft: 2 percent

Yamacall and similar soils: 2 percent

471B—Ethridge loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Ethridge and similar soils

Composition: 90 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 6 inches; loam

Bt-6 to 12 inches; silty clay

Bk-12 to 27 inches; silty clay loam

Bky-27 to 37 inches; silty clay loam

C-37 to 63 inches; silt loam

Additional Components

Sonnett and similar soils: 4 percent

Eapa and similar soils: 3 percent

Ethridge and similar soils: 3 percent

471C—Ethridge loam, 4 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Ethridge and similar soils

Composition: 90 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 4 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 6 inches; loam

Bt-6 to 12 inches; silty clay

Bk-12 to 27 inches; silty clay loam

Bky-27 to 37 inches; silty clay loam

C-37 to 63 inches; silt loam

Additional Components

Sonnett and similar soils: 4 percent

Eapa and similar soils: 3 percent

Ethridge and similar soils: 3 percent

481A—Eapa loam, 0 to 2 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Eapa and similar soils

Composition: 90 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 inches

Typical profile:

A-0 to 8 inches; loam

Bt-8 to 26 inches; clay loam

Bk-26 to 60 inches; fine sandy loam

Additional Components

Creed and similar soils: 3 percent

Ethridge and similar soils: 3 percent

Yamacall and similar soils: 3 percent

Attewan and similar soils: 1 percent

481C—Eapa loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Eapa and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches
Typical profile:
 A-0 to 8 inches; loam
 Bt-8 to 26 inches; clay loam
 Bk-26 to 60 inches; fine sandy loam

Additional Components

Creed and similar soils: 4 percent
 Ethridge and similar soils: 4 percent
 Yamacall and similar soils: 4 percent
 Attewan and similar soils: 3 percent

521C—Floweree-Cambeth silt loams, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Floweree and similar soils

Composition: 45 percent
Geomorphic description: Swale
Slope: 2 to 8 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.3 inches
Typical profile:
 Ap-0 to 7 inches; silt loam
 Bw-7 to 12 inches; silt loam
 Bk-12 to 38 inches; silt loam
 BC-38 to 60 inches; stratified silty clay loam to very fine sandy loam

Cambeth and similar soils

Composition: 40 percent
Geomorphic description: Knoll

Slope: 2 to 8 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches
Typical profile:
A-0 to 3 inches; silt loam
Bw-3 to 11 inches; silt loam
Bk-11 to 32 inches; silt loam
Cr-32 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 3 percent
Cambeth, noncalcareous and similar soils: 3 percent
Lonna and similar soils: 3 percent
Busby and similar soils: 2 percent
Migonot and similar soils: 2 percent
Yawdim and similar soils: 2 percent

522C—Floweree silt loam, calcareous, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,140 to 3,620 feet
Mean annual precipitation: 10 to 12 inches
Frost-free period: 110 to 130 days

Component Description

Floweree, calcareous and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.2 inches
Typical profile:
Ap-0 to 4 inches; silt loam
Bw-4 to 12 inches; silt loam
Bk-12 to 38 inches; silt loam
BC-38 to 60 inches; silty clay loam

Additional Components

Cambeth and similar soils: 5 percent
 Kremlin and similar soils: 5 percent
 Lonna and similar soils: 5 percent

541C—Gerdrum-Yawdim-Fleak complex, 0 to 8 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 16 inches
Frost-free period: 110 to 130 days

Component Description

Gerdrum and similar soils

Composition: 30 percent
Geomorphic description: Alluvial fan
Slope: 0 to 8 percent
Surface layer texture: Clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 5.9 inches
Typical profile:
 Ap-0 to 7 inches; clay loam
 Btn-7 to 11 inches; silty clay loam
 Bknyz-11 to 25 inches; clay
 Bz-25 to 60 inches; clay loam

Yawdim and similar soils

Composition: 25 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale and siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches
Typical profile:
 A-0 to 6 inches; silty clay
 C-6 to 15 inches; silty clay loam
 Cr-15 to 60 inches; bedrock

Fleak and similar soils

Composition: 20 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Loamy sand

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Somewhat excessively drained

Parent material: Residuum weathered from calcareous sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

Typical profile:

A-0 to 7 inches; loamy sand

C-7 to 16 inches; loamy fine sand

Cr-16 to 60 inches; bedrock

Additional Components

Absher and similar soils: 7 percent

Busby and similar soils: 5 percent

Neldore and similar soils: 5 percent

Yamacall and similar soils: 5 percent

Rock outcrop, soft: 3 percent

552B—Gerdrum-Creed complex, 0 to 4 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description**Gerdrum and similar soils**

Composition: 45 percent

Geomorphic description: Micro-low on alluvial fan, micro-low on stream terrace

Slope: 0 to 4 percent

Surface layer texture: Clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

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: Mainly 5.9 inches

Typical profile:

E-0 to 4 inches; clay loam

Btn-4 to 9 inches; silty clay loam

Btkn-9 to 16 inches; silty clay

Bknyz-16 to 25 inches; clay
Bz-25 to 60 inches; clay loam

Creed and similar soils

Composition: 40 percent
Geomorphic description: Micro-high on alluvial fan, micro-high on stream terrace
Slope: 0 to 4 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 6.5 inches
Typical profile:
A-0 to 7 inches; loam
Btn-7 to 15 inches; silty clay
Bky-15 to 28 inches; silty clay loam
By-28 to 60 inches; stratified loam to silty clay loam

Additional Components

Davidell and similar soils: 4 percent
Kobase and similar soils: 4 percent
Vanda and similar soils: 4 percent
Sonnett and similar soils: 3 percent

553B—Gerdrum-Vanda silty clays, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,500 to 3,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Gerdrum and similar soils

Composition: 55 percent
Geomorphic description: Alluvial fan
Slope: 0 to 4 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 6.3 inches

Typical profile:

Ap-0 to 7 inches; silty clay
Btn-7 to 23 inches; silty clay loam
Bknyz-23 to 25 inches; clay
Bz-25 to 60 inches; clay loam

Vanda and similar soils

Composition: 30 percent
Geomorphic description: Alluvial fan
Slope: 0 to 4 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Clayey alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.9 inches

Typical profile:

A-0 to 7 inches; silty clay
Byz-7 to 60 inches; silty clay

Additional Components

Abor and similar soils: 5 percent
Marvan and similar soils: 5 percent
Neldore and similar soils: 5 percent

554A—Gerdrum-Kobase silty clay loams, 0 to 2 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,500 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description**Gerdrum and similar soils**

Composition: 40 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 2 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 6.0 inches

Typical profile:

Ap-0 to 7 inches; silty clay loam
 Btn-7 to 15 inches; silty clay loam
 Bknyz-15 to 25 inches; clay
 Bz-25 to 60 inches; clay loam

Kobase and similar soils

Composition: 40 percent
Geomorphic description: Stream terrace
Slope: 0 to 2 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 3 inches; silty clay loam
 Bw-3 to 15 inches; silty clay loam
 Bk-15 to 27 inches; silty clay loam
 Bky-27 to 60 inches; silty clay loam

Additional Components

Lonna and similar soils: 8 percent
 Yamacall and similar soils: 8 percent
 Slickspots and similar soils: 4 percent

554C—Gerdrum-Kobase silty clay loams, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,500 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Gerdrum and similar soils

Composition: 40 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 6.2 inches

Typical profile:

Ap-0 to 7 inches; silty clay loam

Btn-7 to 19 inches; silty clay loam

Bknyz-19 to 25 inches; clay

Bz-25 to 60 inches; clay loam

Kobase and similar soils

Composition: 40 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; silty clay loam

Bw-4 to 15 inches; silty clay loam

Bk-15 to 19 inches; silty clay loam

Bky-19 to 60 inches; silty clay loam

Additional Components

Lonna and similar soils: 8 percent

Yamacall and similar soils: 8 percent

Slickspots and similar soils: 4 percent

555C—Gerdrum-Marvan silty clays, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,200 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Gerdrum and similar soils

Composition: 50 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Silty clay

Depth to restrictive feature: None noted

Drainage class: Well drained

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: Mainly 6.3 inches

Typical profile:

Ap-0 to 7 inches; silty clay
 Btn-7 to 22 inches; silty clay loam
 Bknyz-22 to 25 inches; clay
 Bz-25 to 60 inches; clay loam

Marvan and similar soils

Composition: 40 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Clayey alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.6 inches

Typical profile:

A-0 to 3 inches; silty clay
 Bss-3 to 28 inches; silty clay
 Byz-28 to 60 inches; silty clay

Additional Components

Kobase and similar soils: 5 percent
 Vanda and similar soils: 5 percent

556D—Gerdrum clay loam, 8 to 15 percent slopes, gullied

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 2,600 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description

Gerdrum and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 8 to 15 percent
Surface layer texture: Clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 5.9 inches

Typical profile:

Ap-0 to 7 inches; clay loam

Btn-7 to 11 inches; silty clay loam

Bknyz-11 to 25 inches; clay

Bz-25 to 60 inches; clay loam

Additional Components

Absher and similar soils: 5 percent

Yamacall and similar soils: 5 percent

Chinook and similar soils: 3 percent

Rock outcrop, soft: 2 percent

557A—Gerdrum clay loam, 0 to 2 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,500 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Gerdrum and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 2 percent

Surface layer texture: Clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

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: Mainly 6.1 inches

Typical profile:

Ap-0 to 7 inches; clay loam

Btn-7 to 18 inches; silty clay loam

Bknyz-18 to 25 inches; clay

Bz-25 to 60 inches; clay loam

Additional Components

Creed and similar soils: 4 percent

Davidell and similar soils: 4 percent

Kobase and similar soils: 4 percent

Vanda and similar soils: 3 percent

557C—Gerdrum clay loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,500 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Gerdrum and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

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: Mainly 6.3 inches

Typical profile:

Ap-0 to 7 inches; clay loam

B_{tn}-7 to 23 inches; silty clay loam

B_{knyz}-23 to 25 inches; clay

B_z-25 to 60 inches; clay loam

Additional Components

Davidell and similar soils: 4 percent

Creed and similar soils: 3 percent

Kobase and similar soils: 3 percent

Vanda and similar soils: 3 percent

Weingart and similar soils: 2 percent

558C—Gerdrum clay loam, 0 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Gerdrum and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 0 to 8 percent
Surface layer texture: Clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 5.9 inches
Typical profile:
 Ap-0 to 7 inches; clay loam
 Btn-7 to 11 inches; silty clay loam
 Bknyz-11 to 25 inches; clay
 Bz-25 to 60 inches; clay loam

Additional Components

Absher and similar soils: 3 percent
 Creed and similar soils: 3 percent
 Gerda and similar soils: 3 percent
 Rominell and similar soils: 3 percent
 Kremlin and similar soils: 2 percent
 Yawdim and similar soils: 1 percent

559C—Gerdrum-Absher clay loams, 0 to 8 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 12 to 16 inches
Frost-free period: 110 to 130 days

Component Description

Absher and similar soils

Composition: 40 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 8 percent
Surface layer texture: Clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 4.2 inches
Typical profile:
 E-0 to 7 inches; clay loam
 Btn-7 to 11 inches; silty clay

Bkny-11 to 30 inches; silty clay loam

Bz-30 to 60 inches; silty clay loam

Gerdrum and similar soils

Composition: 40 percent

Geomorphic description: Alluvial fan

Slope: 0 to 8 percent

Surface layer texture: Clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

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: Mainly 5.9 inches

Typical profile:

Ap-0 to 7 inches; clay loam

Btn-7 to 11 inches; silty clay loam

Bknyz-11 to 25 inches; clay

Bz-25 to 60 inches; clay loam

Additional Components

Rominell and similar soils: 6 percent

Weingart and similar soils: 6 percent

Fleak and similar soils: 4 percent

Yawdim and similar soils: 4 percent

561A—Glendive fine sandy loam, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains, valley

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Glendive and similar soils

Composition: 85 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 7.2 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

C-4 to 60 inches; stratified loamy fine sand to clay loam

Additional Components

Bigsandy and similar soils: 3 percent

Glendive and similar soils: 3 percent

Hanly and similar soils: 3 percent

Havre and similar soils: 3 percent

Ryell and similar soils: 3 percent

**562A—Glendive fine sandy loam, 0 to 2 percent slopes,
occasionally flooded**

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains, valley

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Glendive and similar soils

Composition: 85 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 7.1 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

C-4 to 60 inches; stratified loamy fine sand to silt loam

Additional Components

Bigsandy and similar soils: 3 percent

Hanly and similar soils: 3 percent

Havre and similar soils: 3 percent

Rivra and similar soils: 3 percent

Yamacall and similar soils: 3 percent

563A—Glendive-Havre complex, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Valley, plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Glendive and similar soils

Composition: 50 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 7.1 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

C-4 to 60 inches; stratified loamy fine sand to silt loam

Havre and similar soils

Composition: 40 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 10 inches; loam

C-10 to 60 inches; stratified fine sandy loam to clay loam

Additional Components

Bigsandy and similar soils: 2 percent

Hanly and similar soils: 2 percent

Harlake and similar soils: 2 percent

Rivra and similar soils: 2 percent

Yamacall and similar soils: 2 percent

564A—Glendive loam, 0 to 2 percent slopes, rarely flooded**Map Unit Setting**

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains, valley

Elevation: 1,900 to 2,600 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description**Glendive and similar soils**

Composition: 90 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 8.0 inches

Typical profile:

A-0 to 6 inches; loam

C-6 to 60 inches; stratified loamy fine sand to clay loam

Additional Components

Hanly and similar soils: 4 percent

Havre and similar soils: 4 percent

Lallie and similar soils: 2 percent

591A—Hanly loamy fine sand, 0 to 2 percent slopes, occasionally flooded**Map Unit Setting**

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Valley

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description**Hanly and similar soils**

Composition: 85 percent

Geomorphic description: Flood plain

Slope: 0 to 2 percent

Surface layer texture: Loamy fine sand
Depth to restrictive feature: None noted
Drainage class: Somewhat excessively drained
Parent material: Sandy alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: Mainly 5.8 inches

Typical profile:

A-0 to 8 inches; loamy fine sand
 C-8 to 60 inches; stratified fine sandy loam to sand

Additional Components

Glendive and similar soils: 3 percent
 Harlake and similar soils: 3 percent
 Havre and similar soils: 3 percent
 Rivra and similar soils: 3 percent
 Yetull and similar soils: 3 percent

**601A—Lostriver silty clay, 0 to 2 percent slopes,
occasionally flooded**

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Lostriver and similar soils

Composition: 85 percent
Geomorphic description: Drainageway
Slope: 0 to 2 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Moderately well drained
Parent material: Clayey alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Present
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.6 inches

Typical profile:

A-0 to 3 inches; silty clay
 C-3 to 60 inches; stratified clay loam to silty clay

Additional Components

Gerdrum and similar soils: 3 percent
 Harlake and similar soils: 3 percent

Abor and similar soils: 2 percent
Harlake and similar soils: 2 percent
Havre and similar soils: 2 percent
Vanda and similar soils: 2 percent
McKenzie and similar soils: 1 percent

611A—Havre loam, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains, valley
Elevation: 2,140 to 3,600 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Havre and similar soils

Composition: 85 percent
Geomorphic description: Drainageway, flood plain
Slope: 0 to 2 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: Mainly 9.6 inches
Typical profile:
A-0 to 10 inches; loam
C-10 to 60 inches; stratified fine sandy loam to clay loam

Additional Components

Glendive and similar soils: 3 percent
Bigsandy and similar soils: 2 percent
Hanly and similar soils: 2 percent
Harlake and similar soils: 2 percent
Ismay and similar soils: 2 percent
Ryell and similar soils: 2 percent
Yamacall and similar soils: 2 percent

612A—Havre loam, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Valley, plains

Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Havre and similar soils

Composition: 85 percent
Geomorphic description: Drainageway, flood plain
Slope: 0 to 2 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: Frequent
Available water capacity: Mainly 9.6 inches
Typical profile:
 A-0 to 10 inches; loam
 C-10 to 60 inches; stratified fine sandy loam to clay loam

Additional Components

Bigsandy and similar soils: 3 percent
 Glendive and similar soils: 3 percent
 Hanly and similar soils: 3 percent
 Harlake and similar soils: 3 percent
 Yamacall and similar soils: 3 percent

613A—Havre and Glendive soils, frequently flooded, channeled

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains, valley
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Havre and similar soils

Composition: 45 percent
Geomorphic description: Drainageway, flood plain
Slope: 0 to 2 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: Frequent
Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 10 inches; loam

C-10 to 60 inches; stratified fine sandy loam to clay loam

Glendive and similar soils

Composition: 40 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Frequent

Available water capacity: Mainly 7.1 inches

Typical profile:

A-0 to 5 inches; fine sandy loam

C-5 to 60 inches; stratified loamy fine sand to silt loam

Additional Components

Bigsandy and similar soils: 3 percent

Hanly and similar soils: 3 percent

Lostriver and similar soils: 3 percent

Rivra and similar soils: 2 percent

Ryell and similar soils: 2 percent

Yamacall and similar soils: 2 percent

614A—Havre silty clay loam, 0 to 2 percent slopes, rarely flooded**Map Unit Setting**

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Valley, plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description**Havre and similar soils**

Composition: 85 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.4 inches

Typical profile:

A-0 to 10 inches; silty clay loam

C-10 to 60 inches; stratified fine sandy loam to clay loam

Additional Components

Glendive and similar soils: 4 percent

Havre and similar soils: 4 percent

Yamacall and similar soils: 4 percent

Bigsandy and similar soils: 3 percent

616A—Havre silt loam, 0 to 2 percent slopes, rarely flooded**Map Unit Setting***Interpretive focus:* Cropland, rangeland*Field investigation intensity:* Order 2*Landscape:* Plains, valley*Elevation:* 1,900 to 2,600 feet*Mean annual precipitation:* 12 to 14 inches*Frost-free period:* 110 to 130 days**Component Description****Havre and similar soils***Composition:* 90 percent*Geomorphic description:* Drainageway, flood plain*Slope:* 0 to 2 percent*Surface layer texture:* Silt loam*Depth to restrictive feature:* None noted*Drainage class:* Well drained*Parent material:* Loamy alluvium*Native plant cover type:* Rangeland*Flooding:* Rare*Available water capacity:* Mainly 9.6 inches**Typical profile:**

A-0 to 5 inches; silt loam

C-5 to 60 inches; stratified fine sandy loam to clay loam

Additional Components

Glendive and similar soils: 3 percent

Harlake and similar soils: 3 percent

Lallie and similar soils: 2 percent

Lonna and similar soils: 2 percent

617A—Havre, Harlake, and Glendive soils, channeled**Map Unit Setting***Interpretive focus:* Rangeland*Field investigation intensity:* Order 2*Landscape:* Plains, valley

Elevation: 2,400 to 3,400 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Havre and similar soils

Composition: 35 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Frequent

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 5 inches; loam

C-5 to 60 inches; stratified fine sandy loam to clay loam

Harlake and similar soils

Composition: 30 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Clayey alluvium

Native plant cover type: Rangeland

Flooding: Frequent

Available water capacity: Mainly 9.4 inches

Typical profile:

A-0 to 5 inches; silty clay loam

C-5 to 60 inches; stratified clay to silty clay loam

Glendive and similar soils

Composition: 25 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Frequent

Available water capacity: Mainly 9.7 inches

Typical profile:

A-0 to 6 inches; fine sandy loam

C-6 to 60 inches; loam

Additional Components

Glendive, saline and similar soils: 2 percent

Harlake and similar soils: 2 percent

Havre, rarely flooded and similar soils: 2 percent

Ismay and similar soils: 2 percent
 Havre and similar soils: 1 percent
 Rivra and similar soils: 1 percent

619A—Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Valley
Elevation: 2,250 to 4,000 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Havre and similar soils

Composition: 45 percent
Geomorphic description: Flood plain
Slope: 0 to 2 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: Mainly 9.6 inches
Typical profile:
 A-0 to 7 inches; loam
 C-7 to 60 inches; stratified fine sandy loam to clay loam

Glendive and similar soils

Composition: 40 percent
Geomorphic description: Flood plain
Slope: 0 to 2 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: Mainly 9.1 inches
Typical profile:
 A-0 to 4 inches; fine sandy loam
 C1-4 to 45 inches; loam
 C2-45 to 60 inches; stratified loamy fine sand to silt loam

Additional Components

Harlake and similar soils: 7 percent
 Havre, saline and similar soils: 6 percent
 Riverwash: 2 percent

621A—Harlake-Havre complex, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Valley

Elevation: 2,250 to 4,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Harlake and similar soils

Composition: 45 percent

Geomorphic description: Flood plain

Slope: 0 to 2 percent

Surface layer texture: Silty clay

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Clayey alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.4 inches

Typical profile:

A-0 to 3 inches; silty clay

C-3 to 60 inches; stratified clay to silt loam

Havre and similar soils

Composition: 40 percent

Geomorphic description: Flood plain

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 6 inches; loam

C-6 to 60 inches; stratified fine sandy loam to clay loam

Additional Components

Harlake, saline and similar soils: 15 percent

622A—Havre loam, moist, 0 to 2 percent slopes, occasionally flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Valley

Elevation: 2,250 to 4,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Havre and similar soils

Composition: 90 percent

Geomorphic description: Flood plain

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 7 inches; loam

C-7 to 60 inches; stratified fine sandy loam to clay loam

Additional Components

Glendive and similar soils: 5 percent

Harlake and similar soils: 5 percent

623A—Havre-Glendive complex, 0 to 2 percent slopes, rarely flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Valley

Elevation: 2,250 to 4,000 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Havre and similar soils

Composition: 45 percent

Geomorphic description: Flood plain

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 6 inches; loam

C-6 to 60 inches; stratified fine sandy loam to clay loam

Glendive and similar soils

Composition: 40 percent
Geomorphic description: Flood plain
Slope: 0 to 2 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.3 inches

Typical profile:

A-0 to 4 inches; fine sandy loam
C1-4 to 45 inches; silt loam
C2-45 to 60 inches; stratified loamy fine sand to clay loam

Additional Components

Hanly and similar soils: 5 percent
Harlake and similar soils: 5 percent
Havre, saline and similar soils: 5 percent

**661C—Kobase-Sonnett, thin surface, silty clay loams,
2 to 8 percent slopes****Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description**Kobase and similar soils**

Composition: 50 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches
Typical profile:
Ap-0 to 6 inches; silty clay loam
Bw-6 to 15 inches; silty clay loam
Bk-15 to 31 inches; silty clay loam
Bky-31 to 60 inches; silty clay loam

Sonnett and similar soils

Composition: 40 percent

Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Typical profile:

E-0 to 2 inches; loam
 Bt-2 to 14 inches; silty clay
 Bk-14 to 25 inches; clay loam
 Bky-25 to 60 inches; clay loam

Additional Components

Ethridge and similar soils: 5 percent
 Megonot and similar soils: 5 percent

671C—Kremlin-Delpoint loams, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Kremlin and similar soils

Composition: 50 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.3 inches
Typical profile:
 A-0 to 8 inches; loam
 Bw-8 to 14 inches; loam
 Bk-14 to 40 inches; loam
 BC-40 to 60 inches; stratified sandy loam to silt loam

Delpoint and similar soils

Composition: 35 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

Typical profile:

A-0 to 3 inches; loam

Bw-3 to 12 inches; loam

Bk-12 to 28 inches; loam

Cr-28 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 3 percent

Cambeth and similar soils: 3 percent

Chinook and similar soils: 3 percent

Eapa and similar soils: 3 percent

Twilight and similar soils: 3 percent

672B—Kremlin loam, 0 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Kremlin and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 4 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.8 inches

Typical profile:

A-0 to 6 inches; loam

Bw-6 to 10 inches; loam

Bk-10 to 18 inches; loam

BC-18 to 60 inches; stratified sandy loam to silt loam

Additional Components

Eapa and similar soils: 6 percent

Chinook and similar soils: 5 percent

Cambeth and similar soils: 4 percent

672C—Kremlin loam, 4 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Kremlin and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 4 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.8 inches

Typical profile:

A-0 to 6 inches; loam

Bw-6 to 10 inches; loam

Bk-10 to 18 inches; loam

BC-18 to 60 inches; stratified sandy loam to silt loam

Additional Components

Eapa and similar soils: 5 percent

Yamacall and similar soils: 4 percent

Cambeth and similar soils: 3 percent

Chinook and similar soils: 3 percent

701C—Lonna-Cambeth silt loams, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland (fig. 4)

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Lonna and similar soils

Composition: 50 percent

Geomorphic description: Toeslope on low hill, footslope on low hill

Slope: 2 to 8 percent

Surface layer texture: Silt loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 5 inches; silt loam

Bw-5 to 10 inches; silt loam

Bk-10 to 30 inches; silt loam

BC-30 to 60 inches; silt loam

Cambeth and similar soils

Composition: 35 percent

Geomorphic description: Backslope on low hill

Slope: 2 to 8 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 39 inches

Drainage class: Well drained

Parent material: Residuum weathered from siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock



Figure 4. An area of 701C - Lonna-Cambeth silt loams, 2 to 8 percent slopes, used for small grain production. The very deep Lonna soils are located in the swales. The moderately deep Cambeth soils are located on the knolls.

Additional Components

Floweree and similar soils: 3 percent
Alona and similar soils: 2 percent
Cabbart and similar soils: 2 percent
Kobase and similar soils: 2 percent
Megonot and similar soils: 2 percent
Twilight and similar soils: 2 percent
Yawdim and similar soils: 2 percent

702D—Lonna-Cambeth-Cabbart silt loams, 4 to 12 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,140 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Lonna and similar soils

Composition: 40 percent
Geomorphic description: Footslope on low hill
Slope: 4 to 12 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches
Typical profile:
A-0 to 5 inches; silt loam
Bw-5 to 10 inches; silt loam
Bk-10 to 30 inches; silt loam
BC-30 to 60 inches; silt loam

Cambeth and similar soils

Composition: 30 percent
Geomorphic description: Backslope on low hill
Slope: 4 to 12 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 39 inches
Drainage class: Well drained
Parent material: Residuum weathered from siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches
Typical profile:
A-0 to 3 inches; silt loam
Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock

Cabbart and similar soils

Composition: 15 percent

Geomorphic description: Shoulder on low hill

Slope: 4 to 12 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 3 inches; silt loam

Bk-3 to 12 inches; silt loam

BC-12 to 17 inches; loam

Cr-17 to 60 inches; bedrock

Additional Components

Kobase and similar soils: 3 percent

Busby and similar soils: 2 percent

Floweree and similar soils: 2 percent

Megonot and similar soils: 2 percent

Twilight and similar soils: 2 percent

Yawdim and similar soils: 2 percent

Cabbart, moist and similar soils: 1 percent

Rock outcrop, soft: 1 percent

703A—Lonna-Havre-Glendive complex, 0 to 2 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains, valley

Elevation: 2,140 to 3,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Lonna and similar soils

Composition: 35 percent

Geomorphic description: Drainageway, stream terrace

Slope: 0 to 2 percent

Surface layer texture: Silt loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 10 inches; silt loam

Bk-10 to 30 inches; silt loam

BC-30 to 60 inches; silt loam

Havre and similar soils

Composition: 30 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 10 inches; loam

C-10 to 60 inches; stratified fine sandy loam to clay loam

Glendive and similar soils

Composition: 25 percent

Geomorphic description: Drainageway, flood plain

Slope: 0 to 2 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 7.1 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

C-4 to 60 inches; stratified loamy fine sand to silt loam

Additional Components

Bigsandy and similar soils: 3 percent

Havre and similar soils: 3 percent

Alona and similar soils: 2 percent

Hanly and similar soils: 2 percent

704D—Lonna, Cambeth, and Yamacall soils, 8 to 15 percent slopes, gullied

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Lonna and similar soils

Composition: 35 percent

Geomorphic description: Alluvial fan

Slope: 8 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 10 inches; silt loam

Bk-10 to 30 inches; silt loam

BC-30 to 60 inches; silty clay loam

Cambeth and similar soils

Composition: 30 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock

Yamacall and similar soils

Composition: 20 percent

Geomorphic description: Alluvial fan

Slope: 8 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; loam

Bw-4 to 11 inches; loam

Bk-11 to 48 inches; loam

C-48 to 60 inches; loam

Additional Components

Alona and similar soils: 3 percent
Busby and similar soils: 3 percent
Cabbart and similar soils: 3 percent
Kobase and similar soils: 3 percent
Rock outcrop, soft: 3 percent

705A—Lonna silt loam, 0 to 2 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Lonna and similar soils

Composition: 85 percent
Geomorphic description: Stream terrace
Slope: 0 to 2 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches
Typical profile:
A-0 to 7 inches; silt loam
Bw-7 to 22 inches; silt loam
Bk-22 to 30 inches; silt loam
BC-30 to 60 inches; silty clay loam

Additional Components

Busby and similar soils: 4 percent
Kobase and similar soils: 4 percent
Yamacall and similar soils: 4 percent
Lonna and similar soils: 3 percent

705C—Lonna silt loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,140 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Lonna and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Typical profile:

A-0 to 7 inches; silt loam
Bw-7 to 12 inches; silt loam
Bk-12 to 30 inches; silt loam
BC-30 to 60 inches; silt loam

Additional Components

Cabbart and similar soils: 3 percent
Cambeth and similar soils: 3 percent
Floweree and similar soils: 3 percent
Busby and similar soils: 2 percent
Kobase and similar soils: 2 percent
Yamacall and similar soils: 2 percent

706A—Lonna-Alona silt loams, 0 to 2 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Lonna and similar soils

Composition: 70 percent
Geomorphic description: Stream terrace
Slope: 0 to 2 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.0 inches

Typical profile:

A-0 to 5 inches; silt loam

Bw-5 to 26 inches; silt loam
 Bk-26 to 30 inches; silt loam
 BC-30 to 60 inches; silty clay loam

Alona and similar soils

Composition: 20 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 2 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 7.4 inches
Typical profile:
 A-0 to 8 inches; silt loam
 Bw-8 to 14 inches; silty clay loam
 Bk-14 to 21 inches; silty clay loam
 Bz-21 to 60 inches; silty clay loam

Additional Components

Antwerp and similar soils: 8 percent
 Lonna and similar soils: 2 percent

707C—Lonna silty clay loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,500 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Lonna and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches
Typical profile:
 A-0 to 3 inches; silty clay loam
 Bw-3 to 18 inches; silt loam

Bk-18 to 30 inches; silt loam
BC-30 to 60 inches; silty clay loam

Additional Components

Gerdrum and similar soils: 8 percent
Kobase and similar soils: 7 percent

708E—Lonna-Cabbart-Yawdim complex, 8 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,600 to 3,600 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Lonna and similar soils

Composition: 50 percent
Geomorphic description: Swale
Slope: 8 to 15 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches
Typical profile:
A-0 to 3 inches; silt loam
Bw-3 to 21 inches; silt loam
Bk-21 to 30 inches; silt loam
BC-30 to 60 inches; silty clay loam

Cabbart and similar soils

Composition: 20 percent
Geomorphic description: Hill
Slope: 8 to 25 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.0 inches
Typical profile:
A-0 to 2 inches; silt loam
Bk-2 to 12 inches; loam
Cr-12 to 60 inches; bedrock

Yawdim and similar soils

Composition: 15 percent
Geomorphic description: Hill
Slope: 8 to 25 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale and siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches
Typical profile:
 A-0 to 4 inches; silty clay loam
 C-4 to 15 inches; silty clay loam
 Cr-15 to 60 inches; bedrock

Additional Components

Busby and similar soils: 4 percent
 Kobase and similar soils: 4 percent
 Yamacall and similar soils: 4 percent
 Cambeth and similar soils: 3 percent

731A—Marias silty clay, 0 to 2 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description**Marias and similar soils**

Composition: 85 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 2 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Clayey alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches
Typical profile:
 A-0 to 15 inches; silty clay
 Bss-15 to 33 inches; clay
 Bssy-33 to 60 inches; clay

Additional Components

Marvan and similar soils: 8 percent

Kobase and similar soils: 7 percent

731C—Marias silty clay, 2 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description**Marias and similar soils**

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Silty clay

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Clayey alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.6 inches

Typical profile:

A-0 to 15 inches; silty clay

Bss-15 to 33 inches; clay

Bssy-33 to 60 inches; clay

Additional Components

Marvan and similar soils: 8 percent

Kobase and similar soils: 7 percent

741C—Marvan-Vanda silty clays, 0 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description**Marvan and similar soils**

Composition: 50 percent

Geomorphic description: Alluvial fan, stream terrace

Slope: 0 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Clayey alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.7 inches
Typical profile:
 A-0 to 3 inches; silty clay
 Bss-3 to 35 inches; silty clay
 Byz-35 to 60 inches; silty clay

Vanda and similar soils

Composition: 35 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Clayey alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.9 inches
Typical profile:
 E-0 to 1 inch; silty clay
 Byz-1 to 60 inches; silty clay

Additional Components

Abor and similar soils: 5 percent
 Gerdrum and similar soils: 5 percent
 Neldore and similar soils: 5 percent

792D—Neldore-Abor silty clays, 2 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Neldore and similar soils

Composition: 45 percent
Geomorphic description: Knoll
Slope: 2 to 15 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained

Parent material: Clayey residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

Typical profile:

A-0 to 3 inches; silty clay

C1-3 to 12 inches; clay

C2-12 to 18 inches; clay

Cr-18 to 60 inches; bedrock

Abor and similar soils

Composition: 40 percent

Geomorphic description: Knoll

Slope: 2 to 15 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.5 inches

Typical profile:

A-0 to 5 inches; silty clay

Bss-5 to 11 inches; silty clay

Bky-11 to 23 inches; silty clay

Cr-23 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 4 percent

Gerdrum and similar soils: 4 percent

Marvan and similar soils: 4 percent

Rock outcrop, soft: 3 percent

792E—Neldore-Abor silty clays, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 100 to 135 days

Component Description

Neldore and similar soils

Composition: 50 percent

Geomorphic description: Hill

Slope: 8 to 25 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Clayey residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.2 inches

Typical profile:

A-0 to 3 inches; silty clay

C-3 to 15 inches; clay

Cr-15 to 60 inches; bedrock

Abor and similar soils

Composition: 40 percent

Geomorphic description: Hill

Slope: 8 to 25 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.4 inches

Typical profile:

A-0 to 4 inches; silty clay

Bss-4 to 11 inches; silty clay

Bky-11 to 36 inches; silty clay

Cr-36 to 60 inches; bedrock

Additional Components

Marvan and similar soils: 5 percent

Vaeda and similar soils: 3 percent

Rock outcrop, soft: 2 percent

793E—Neldore-Arsite-Neldore, saline, complex, 2 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,600 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 100 to 135 days

Component Description

Neldore and similar soils

Composition: 45 percent

Geomorphic description: Hill

Slope: 2 to 25 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Clayey residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

Typical profile:

A-0 to 2 inches; silty clay
 C-2 to 14 inches; clay
 Cr-14 to 60 inches; bedrock

Arsite and similar soils

Composition: 25 percent
Geomorphic description: Hill
Slope: 2 to 15 percent
Surface layer texture: Clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Available water capacity: Mainly 1.0 inches

Typical profile:

A-0 to 2 inches; clay
 Cyz-2 to 12 inches; clay
 Cr-12 to 60 inches; bedrock

Neldore, saline and similar soils

Composition: 15 percent
Geomorphic description: Hill
Slope: 2 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

Typical profile:

A-0 to 2 inches; silty clay
 C-2 to 16 inches; silty clay
 Cr-16 to 60 inches; bedrock

Additional Components

Abor and similar soils: 5 percent
 Niler and similar soils: 5 percent
 Vaeda and similar soils: 5 percent

795D—Neldore-Neldore, saline, silty clays, 4 to 15 percent slopes**Map Unit Setting**

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,600 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Neldore and similar soils

Composition: 45 percent
Geomorphic description: Knoll
Slope: 4 to 15 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.3 inches
Typical profile:
 A-0 to 3 inches; silty clay
 C-3 to 16 inches; clay
 Cr-16 to 60 inches; bedrock

Neldore, saline and similar soils

Composition: 35 percent
Geomorphic description: Knoll
Slope: 4 to 8 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.6 inches
Typical profile:
 A-0 to 4 inches; silty clay
 C-4 to 14 inches; silty clay
 Cr-14 to 60 inches; bedrock

Additional Components

Abor and similar soils: 5 percent
 Brunelda and similar soils: 5 percent
 Bullock and similar soils: 5 percent
 Vaeda and similar soils: 5 percent

795E—Weingart-Neldore complex, 4 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 100 to 135 days

Component Description

Weingart and similar soils

Composition: 55 percent

Geomorphic description: Hill
Slope: 4 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from clayey shale
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.1 inches
Typical profile:
 E-0 to 2 inches; loam
 Btn-2 to 13 inches; clay
 Bkn-13 to 21 inches; clay
 Bnyz-21 to 35 inches; clay
 Cr-35 to 60 inches; bedrock

Neldore and similar soils

Composition: 20 percent
Geomorphic description: Hill
Slope: 4 to 25 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.4 inches
Typical profile:
 A-0 to 2 inches; silty clay
 C-2 to 17 inches; clay
 Cr-17 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 5 percent
 Cambeth and similar soils: 5 percent
 Gerdrum and similar soils: 5 percent
 Lonna and similar soils: 5 percent
 Rock outcrop, soft: 3 percent
 Neldore and similar soils: 2 percent

796D—Abor-Neldore silty clays, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Abor and similar soils

Composition: 55 percent
Geomorphic description: Knoll
Slope: 4 to 15 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches
Typical profile:
A-0 to 2 inches; silty clay
Bss-2 to 11 inches; silty clay
Bky-11 to 35 inches; silty clay
Cr-35 to 60 inches; bedrock

Neldore and similar soils

Composition: 30 percent
Geomorphic description: Knoll
Slope: 4 to 15 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.0 inches
Typical profile:
A-0 to 3 inches; silty clay
C-3 to 14 inches; clay
Cr-14 to 60 inches; bedrock

Additional Components

Marvan and similar soils: 8 percent

Vaeda and similar soils: 7 percent

796E—Weingart, gullied-Niler, gullied-Rock outcrop, soft, complex, 2 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Weingart, gullied and similar soils

Composition: 30 percent
Geomorphic description: Knoll
Slope: 2 to 15 percent
Surface layer texture: Clay loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from clayey shale
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.4 inches
Typical profile:
 Ap-0 to 7 inches; clay loam
 Btn-7 to 16 inches; clay
 Bknyz-16 to 25 inches; clay
 Cr-25 to 60 inches; bedrock

Niler, gullied and similar soils

Composition: 30 percent
Geomorphic description: Hill
Slope: 2 to 25 percent
Surface layer texture: Clay loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Clayey residuum weathered from shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.5 inches
Typical profile:
 A-0 to 3 inches; clay loam
 By-3 to 13 inches; silty clay loam
 Cr-13 to 60 inches; bedrock

Rock outcrop, soft

Composition: 25 percent
Geomorphic description: None assigned

Additional Components

Marvan and similar soils: 8 percent
 Chinook and similar soils: 7 percent

797E—Niler silty clay loam, 4 to 35 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Niler and similar soils

Composition: 85 percent

Geomorphic description: Hill

Slope: 4 to 35 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Clayey residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.5 inches

Typical profile:

A-0 to 3 inches; silty clay loam

By-3 to 13 inches; silty clay loam

Cr-13 to 60 inches; bedrock

Additional Components

Cambeth and similar soils: 10 percent

Rock outcrop, soft: 5 percent

841C—Ralph-Brushton silt loams, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Ralph and similar soils

Composition: 45 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from shale and siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.5 inches

Typical profile:

A-0 to 7 inches; silt loam

Bt-7 to 15 inches; silty clay loam

Bk-15 to 28 inches; silty clay loam

Cr-28 to 60 inches; bedrock

Brushton and similar soils

Composition: 40 percent
Geomorphic description: Swale
Slope: 2 to 8 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.2 inches

Typical profile:

A-0 to 6 inches; silt loam
Bt-6 to 18 inches; silty clay loam
Bk-18 to 36 inches; silt loam
BC-36 to 60 inches; silt loam

Additional Components

Megonot and similar soils: 3 percent
Twilight and similar soils: 3 percent
Cabbart and similar soils: 2 percent
Cambeth and similar soils: 2 percent
Weingart and similar soils: 2 percent
Yawdim and similar soils: 2 percent
Rock outcrop, soft: 1 percent

851A—Rivra complex, 0 to 2 percent slopes, frequently flooded**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Valley
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description**Rivra and similar soils**

Composition: 45 percent
Geomorphic description: Flood plain
Slope: 0 to 2 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Gravelly alluvium
Native plant cover type: Rangeland
Flooding: Common
Water table: Present
Available water capacity: Mainly 3.1 inches

Typical profile:

A-0 to 9 inches; loam

C-9 to 60 inches; extremely gravelly sand

Rivra and similar soils*Composition:* 40 percent*Geomorphic description:* Flood plain*Slope:* 0 to 2 percent*Surface layer texture:* Gravelly sandy loam*Depth to restrictive feature:* None noted*Drainage class:* Well drained*Parent material:* Gravelly alluvium*Native plant cover type:* Rangeland*Flooding:* Common*Water table:* Present*Available water capacity:* Mainly 2.5 inches**Typical profile:**

A-0 to 9 inches; gravelly sandy loam

C-9 to 60 inches; extremely gravelly sand

Additional Components

Glendive and similar soils: 4 percent

Hanly and similar soils: 4 percent

Havre and similar soils: 4 percent

Bigsandy and similar soils: 3 percent

861C—Archin-Gerdrum loams, 2 to 8 percent slopes**Map Unit Setting***Interpretive focus:* Cropland, rangeland*Field investigation intensity:* Order 2*Landscape:* Plains*Elevation:* 2,240 to 3,620 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 105 to 135 days**Component Description****Archin and similar soils***Composition:* 50 percent*Geomorphic description:* Alluvial fan*Slope:* 2 to 8 percent*Surface layer texture:* Loam*Depth to restrictive feature:* None noted*Drainage class:* Well drained*Parent material:* Sandy alluvium, loamy alluvium*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 7.1 inches

Typical profile:

A-0 to 4 inches; loam
E-4 to 7 inches; loam
Btn-7 to 20 inches; clay loam
Bky-20 to 28 inches; loam
C-28 to 60 inches; loam

Gerdrum and similar soils

Composition: 35 percent
Geomorphic description: Micro-low on alluvial fan and stream terrace
Slope: 2 to 8 percent
Surface layer texture: Clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
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: Mainly 5.9 inches

Typical profile:

E-0 to 4 inches; clay loam
Btn-4 to 9 inches; silty clay loam
Btkn-9 to 16 inches; silty clay
Bknyz-16 to 25 inches; clay
Bz-25 to 60 inches; clay loam

Additional Components

Chinook and similar soils: 4 percent
Kobase and similar soils: 4 percent
Sonnett and similar soils: 4 percent
Delpoint and similar soils: 3 percent

862C—Rominell loam, 0 to 8 percent slopes, gullied**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 2,600 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 110 to 130 days

Component Description**Rominell and similar soils**

Composition: 85 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained

Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.6 inches

Typical profile:

A-0 to 4 inches; loam
 E-4 to 9 inches; fine sandy loam
 Btn-9 to 25 inches; clay loam
 Byz-25 to 60 inches; clay loam

Additional Components

Benz and similar soils: 4 percent
 Kremlin and similar soils: 4 percent
 Yawdim and similar soils: 4 percent
 Chinook and similar soils: 3 percent

863B—Rominell fine sandy loam, thin surface, 1 to 4 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,700 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Rominell and similar soils

Composition: 85 percent
Geomorphic description: Alluvial fan
Slope: 1 to 4 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.4 inches

Typical profile:

A-0 to 6 inches; fine sandy loam
 Btn-6 to 13 inches; clay loam
 Byz-13 to 60 inches; clay loam

Additional Components

Foreleft and similar soils: 8 percent
 Slickspots and similar soils: 7 percent

864C—Rominell loam, 0 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland (fig. 5)

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 2,600 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Rominell and similar soils

Composition: 90 percent

Geomorphic description: Alluvial fan

Slope: 0 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 7.6 inches

Typical profile:

A-0 to 4 inches; loam



Figure 5. An area of map unit 864C - Rominell loam, 0 to 8 percent slopes, in southern Garfield County is in the foreground. The "Claypan" ecological site is the result of soil sodicity.

E-4 to 9 inches; fine sandy loam
 Btn-9 to 15 inches; clay loam
 Bnyz-15 to 25 inches; loam
 Byz-25 to 60 inches; clay loam

Additional Components

Gerdrum and similar soils: 3 percent
 Kremlin and similar soils: 3 percent
 Chinook and similar soils: 2 percent
 Yawdim and similar soils: 2 percent

901A—Sonnett-Sonnett, thin surface, complex, 0 to 2 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Sonnett and similar soils

Composition: 50 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 2 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Typical profile:

E-0 to 6 inches; loam
 Bt-6 to 14 inches; silty clay
 Bk-14 to 25 inches; clay loam
 Bky-25 to 60 inches; clay loam

Sonnett and similar soils

Composition: 40 percent
Geomorphic description: Alluvial fan, stream terrace
Slope: 0 to 2 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Typical profile:

E-0 to 2 inches; loam
Bt-2 to 14 inches; silty clay
Bk-14 to 25 inches; clay loam
Bky-25 to 60 inches; clay loam

Additional Components

Kobase and similar soils: 4 percent
Gerdrum and similar soils: 3 percent
Vanda and similar soils: 3 percent

901C—Sonnett-Sonnett, thin surface, complex, 2 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description**Sonnett and similar soils**

Composition: 50 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Typical profile:

E-0 to 6 inches; loam
Bt-6 to 14 inches; silty clay
Bk-14 to 25 inches; clay loam
Bky-25 to 60 inches; clay loam

Sonnett and similar soils

Composition: 40 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Typical profile:

E-0 to 2 inches; loam
 Bt-2 to 14 inches; silty clay
 Bk-14 to 25 inches; clay loam
 Bky-25 to 60 inches; clay loam

Additional Components

Ethridge and similar soils: 2 percent
 Gerdrum and similar soils: 2 percent
 Kobase and similar soils: 2 percent
 Vanda and similar soils: 2 percent
 Yamacall and similar soils: 2 percent

914D—Yetull-Busby complex, 2 to 15 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description**Yetull and similar soils**

Composition: 45 percent
Geomorphic description: Knoll
Slope: 2 to 15 percent
Surface layer texture: Loamy fine sand
Depth to restrictive feature: None noted
Drainage class: Somewhat excessively drained
Parent material: Sandy eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.6 inches
Typical profile:
 A-0 to 6 inches; loamy fine sand
 C-6 to 60 inches; loamy sand

Busby and similar soils

Composition: 45 percent
Geomorphic description: Interdune
Slope: 2 to 15 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium, eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.7 inches
Typical profile:
 A-0 to 4 inches; fine sandy loam

Bw-4 to 13 inches; fine sandy loam
Bk-13 to 47 inches; fine sandy loam
C-47 to 60 inches; loamy fine sand

Additional Components

Blacksheep and similar soils: 3 percent
Twilight and similar soils: 3 percent
Blowouts: 2 percent
Rock outcrop, soft: 2 percent

915C—Busby-Yetull fine sandy loams, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 2,600 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description

Busby and similar soils

Composition: 50 percent
Geomorphic description: Alluvial fan
Slope: 2 to 8 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium, eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches

Typical profile:

A-0 to 5 inches; fine sandy loam
Bw-5 to 11 inches; fine sandy loam
Bk-11 to 47 inches; fine sandy loam
C-47 to 60 inches; fine sandy loam

Yetull and similar soils

Composition: 40 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Somewhat excessively drained
Parent material: Sandy eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.0 inches

Typical profile:

A-0 to 6 inches; fine sandy loam

C-6 to 60 inches; loamy sand

Additional Components

Twilight and similar soils: 4 percent

Cabbart and similar soils: 3 percent

Chinook and similar soils: 3 percent

916D—Twilight-Yetull fine sandy loams, 8 to 15 percent slopes**Map Unit Setting***Interpretive focus:* Rangeland*Field investigation intensity:* Order 2*Landscape:* Plains*Elevation:* 1,900 to 2,600 feet*Mean annual precipitation:* 12 to 16 inches*Frost-free period:* 110 to 130 days**Component Description****Twilight and similar soils***Composition:* 45 percent*Geomorphic description:* Knoll*Slope:* 8 to 15 percent*Surface layer texture:* Fine sandy loam*Depth to restrictive feature:* Bedrock (paralithic): 20 to 40 inches*Drainage class:* Well drained*Parent material:* Residuum weathered from sandstone*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 3.7 inches**Typical profile:**

A-0 to 5 inches; fine sandy loam

Bw-5 to 16 inches; fine sandy loam

Bk-16 to 25 inches; fine sandy loam

Cr-25 to 60 inches; bedrock

Yetull and similar soils*Composition:* 35 percent*Geomorphic description:* Knoll*Slope:* 8 to 15 percent*Surface layer texture:* Fine sandy loam*Depth to restrictive feature:* None noted*Drainage class:* Somewhat excessively drained*Parent material:* Sandy eolian deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.0 inches**Typical profile:**

A-0 to 6 inches; fine sandy loam

C-6 to 60 inches; loamy sand

Additional Components

Cabbart and similar soils: 7 percent
Yamacall and similar soils: 6 percent
Rominell and similar soils: 4 percent
Fleak and similar soils: 3 percent

931D—Telstad-Hillon loams, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,000 to 3,620 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days

Component Description

Telstad and similar soils

Composition: 40 percent
Geomorphic description: Alluvial fan, knoll
Slope: 8 to 15 percent
Elevation: 2,000 to 2,500 feet
Effective annual precipitation: 12 to 14 inches
Frost-free period: 110 to 130 days
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches
Typical profile:
A-0 to 4 inches; loam
Bt-4 to 13 inches; clay loam
Bk1-13 to 22 inches; loam
Bk2-22 to 60 inches; loam

Hillon and similar soils

Composition: 40 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.2 inches
Typical profile:
A-0 to 7 inches; loam
Bk-7 to 60 inches; loam

Additional Components

Thoeny and similar soils: 9 percent
 Yamacall and similar soils: 6 percent
 Yawdim and similar soils: 5 percent

941E—Cabbart-Havre loams, 0 to 35 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Cabbart and similar soils

Composition: 60 percent
Geomorphic description: Drainageway
Slope: 2 to 35 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches
Typical profile:
 A-0 to 3 inches; loam
 Bk-3 to 12 inches; silt loam
 BC-12 to 17 inches; loam
 Cr-17 to 60 inches; bedrock

Havre and similar soils

Composition: 25 percent
Geomorphic description: Drainageway
Slope: 0 to 2 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Loamy alluvium
Native plant cover type: Rangeland
Flooding: Frequent
Available water capacity: Mainly 9.6 inches
Typical profile:
 A-0 to 10 inches; loam
 C-10 to 60 inches; stratified fine sandy loam to clay loam

Additional Components

Rock outcrop, soft: 3 percent
 Bigsandy and similar soils: 2 percent

Glendive and similar soils: 2 percent
Glendive, saline and similar soils: 2 percent
Harlake and similar soils: 2 percent
Kobase and similar soils: 2 percent
Yamacall and similar soils: 2 percent

942A—Havre-Bigsandy loams, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

Interpretive focus: Cropland, rangeland (fig. 6)
Field investigation intensity: Order 2
Landscape: Plains, valley
Elevation: 1,900 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Havre and similar soils

Composition: 50 percent
Geomorphic description: Drainageway
Slope: 0 to 2 percent
Surface layer texture: Loam



Figure 6. An area of map unit 942A - Havre-Bigsandy loams, 0 to 2 percent slopes, frequently flooded in southeastern Garfield County. The well drained Havre soil is on low stream terraces. The Bigsandy soil is located in low areas next to the stream channel and has a seasonal high water table from 12 to 24 inches.

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Loamy alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 10 inches; loam

C-10 to 60 inches; stratified fine sandy loam to clay loam

Bigsandy and similar soils

Composition: 40 percent

Geomorphic description: Drainageway

Slope: 0 to 2 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Poorly drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Frequent

Water table: Present

Available water capacity: Mainly 7.9 inches

Typical profile:

A-0 to 3 inches; loam

C-3 to 14 inches; stratified fine sandy loam to silty clay loam

Cg1-14 to 30 inches; stratified fine sandy loam to silty clay loam

Cg2-30 to 60 inches; stratified fine sand to clay

Additional Components

Alona and similar soils: 2 percent

Glendive and similar soils: 2 percent

Havre and similar soils: 2 percent

Ismay and similar soils: 2 percent

Lonna and similar soils: 2 percent

981C—Yamacall-Delpoint loams, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Yamacall and similar soils

Composition: 50 percent

Geomorphic description: Swale

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; loam
Bw-4 to 11 inches; loam
Bk-11 to 48 inches; loam
C-48 to 60 inches; loam

Delpoint and similar soils

Composition: 35 percent
Geomorphic description: Knoll
Slope: 2 to 8 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Typical profile:

A-0 to 3 inches; loam
Bw-3 to 12 inches; loam
Bk-12 to 28 inches; loam
Cr-28 to 60 inches; bedrock

Additional Components

Busby and similar soils: 4 percent
Cabbart and similar soils: 4 percent
Twilight and similar soils: 4 percent
Cambeth and similar soils: 3 percent

981D—Yamacall-Delpoint loams, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland
Field investigation intensity: Order 2
Landscape: Plains
Elevation: 2,600 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Yamacall and similar soils

Composition: 50 percent
Geomorphic description: Alluvial fan
Slope: 4 to 15 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.1 inches

Typical profile:

A-0 to 4 inches; loam

Bw-4 to 15 inches; loam

Bk-15 to 45 inches; loam

C-45 to 60 inches; stratified gravelly loam to loamy sand

Delpoint and similar soils

Composition: 35 percent

Geomorphic description: Knoll

Slope: 4 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.6 inches

Typical profile:

A-0 to 6 inches; loam

Bw-6 to 12 inches; loam

Bk-12 to 28 inches; loam

Cr-28 to 60 inches; bedrock

Additional Components

Busby and similar soils: 4 percent

Cabbart and similar soils: 4 percent

Colstrip and similar soils: 4 percent

Rock outcrop, soft: 3 percent

982D—Yamacall-Delpoint-Cabbart loams, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Yamacall and similar soils

Composition: 35 percent

Geomorphic description: Swale

Slope: 8 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches
Typical profile:
A-0 to 4 inches; loam
Bw-4 to 11 inches; loam
Bk-11 to 48 inches; loam
C-48 to 60 inches; loam

Delpoint and similar soils

Composition: 30 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches
Typical profile:
A-0 to 3 inches; loam
Bw-3 to 12 inches; loam
Bk-12 to 28 inches; loam
Cr-28 to 60 inches; bedrock

Cabbart and similar soils

Composition: 15 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches
Typical profile:
A-0 to 3 inches; loam
Bk-3 to 12 inches; silt loam
BC-12 to 17 inches; loam
Cr-17 to 60 inches; bedrock

Additional Components

Busby and similar soils: 5 percent
Cambeth and similar soils: 5 percent
Yawdim and similar soils: 5 percent
Twilight and similar soils: 3 percent
Rock outcrop, soft: 2 percent

983D—Yamacall-Twilight-Blacksheep complex, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Yamacall and similar soils

Composition: 35 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 5 inches; loam

Bw-5 to 11 inches; loam

Bk-11 to 48 inches; loam

C-48 to 60 inches; loam

Twilight and similar soils

Composition: 30 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.1 inches

Typical profile:

A-0 to 4 inches; fine sandy loam

Bw-4 to 16 inches; fine sandy loam

Bk-16 to 28 inches; fine sandy loam

Cr-28 to 60 inches; bedrock

Blacksheep and similar soils

Composition: 20 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.2 inches

Typical profile:

A-0 to 7 inches; fine sandy loam

Bk-7 to 15 inches; fine sandy loam

Cr-15 to 60 inches; bedrock

Additional Components

Busby and similar soils: 5 percent

Yawdim and similar soils: 5 percent

Delpoint and similar soils: 3 percent

Rock outcrop, hard: 1 percent

Rock outcrop, soft: 1 percent

984C—Yamacall loam, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Yamacall and similar soils

Composition: 85 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Typical profile:

A-0 to 5 inches; loam

Bw-5 to 13 inches; loam

Bk-13 to 48 inches; loam

C-48 to 60 inches; loam

Additional Components

Busby and similar soils: 4 percent

Delpoint and similar soils: 4 percent

Kobase and similar soils: 3 percent

Lonna and similar soils: 3 percent

Alona and similar soils: 1 percent

985C—Yamacall-Busby complex, 2 to 8 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,140 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Yamacall and similar soils

Composition: 50 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.0 inches

Typical profile:

A-0 to 3 inches; loam

Bw-3 to 13 inches; loam

Bk-13 to 42 inches; loam

C-42 to 60 inches; stratified gravelly loam to loamy sand

Busby and similar soils

Composition: 40 percent

Geomorphic description: Alluvial fan

Slope: 2 to 8 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium, eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.3 inches

Typical profile:

A-0 to 5 inches; fine sandy loam

Bw-5 to 11 inches; fine sandy loam

Bk-11 to 47 inches; fine sandy loam

C-47 to 60 inches; fine sandy loam

Additional Components

Yetull and similar soils: 4 percent

Rock outcrop, soft: 2 percent

986C—Yamacall-Twilight complex, 2 to 8 percent slopes**Map Unit Setting**

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 16 inches

Frost-free period: 110 to 130 days

Component Description**Yamacall and similar soils**

Composition: 50 percent

Geomorphic description: Swale

Slope: 2 to 8 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; loam

Bw-4 to 11 inches; loam

Bk-11 to 50 inches; loam

C-50 to 60 inches; loam

Twilight and similar soils

Composition: 30 percent

Geomorphic description: Knoll

Slope: 2 to 8 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.7 inches

Typical profile:

A-0 to 5 inches; fine sandy loam

Bw-5 to 16 inches; fine sandy loam

Bk-16 to 25 inches; fine sandy loam

Cr-25 to 60 inches; bedrock

Additional Components

Busby and similar soils: 5 percent

Cabbart and similar soils: 5 percent

Fleak and similar soils: 5 percent

Kremlin and similar soils: 5 percent

987D—Yamacall-Twilight-Fleak complex, 8 to 15 percent slopes

Map Unit Setting

Interpretive focus: Cropland, rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Frost-free period: 110 to 130 days

Component Description

Yamacall and similar soils

Composition: 35 percent

Geomorphic description: Swale

Slope: 8 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; loam

Bw-4 to 11 inches; loam

Bk-11 to 50 inches; loam

C-50 to 60 inches; loam

Twilight and similar soils

Composition: 30 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Fine sandy loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Residuum weathered from sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.7 inches

Typical profile:

A-0 to 5 inches; fine sandy loam

Bw-5 to 16 inches; fine sandy loam

Bk-16 to 25 inches; fine sandy loam

Cr-25 to 60 inches; bedrock

Fleak and similar soils

Composition: 20 percent

Geomorphic description: Knoll

Slope: 8 to 15 percent

Surface layer texture: Loamy sand

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Somewhat excessively drained

Parent material: Residuum weathered from calcareous sandstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

Typical profile:

A-0 to 7 inches; loamy sand

C-7 to 16 inches; loamy fine sand

Cr-16 to 60 inches; bedrock

Additional Components

Busby and similar soils: 4 percent

Cabbart and similar soils: 4 percent

Rominell and similar soils: 4 percent

Rock outcrop, soft: 2 percent

Rock outcrop, hard: 1 percent

989E—Yamacall-Cabbart loams, 8 to 25 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Yamacall and similar soils

Composition: 50 percent

Geomorphic description: Hill

Slope: 8 to 15 percent

Surface layer texture: Loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.0 inches

Typical profile:

A-0 to 5 inches; loam

Bw-5 to 11 inches; loam

Bk-11 to 42 inches; loam

C-42 to 60 inches; stratified gravelly loam to loamy sand

Cabbart and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 8 to 25 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Typical profile:

A-0 to 3 inches; loam

Bk-3 to 18 inches; loam

Cr-18 to 60 inches; bedrock

Additional Components

Birney and similar soils: 8 percent

Delpoint and similar soils: 7 percent

Colstrip and similar soils: 3 percent

Rock outcrop, soft: 2 percent

991F—Yawdim-Cabbart-Kobase complex, 15 to 70 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Yawdim and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 15 to 70 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from shale and siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

Typical profile:

A-0 to 2 inches; silty clay loam

C-2 to 10 inches; silty clay loam

Cr-10 to 60 inches; bedrock

Cabbart and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 15 to 70 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

Typical profile:

A-0 to 2 inches; silt loam

Bk-2 to 12 inches; loam

Cr-12 to 60 inches; bedrock

Kobase and similar soils

Composition: 25 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Silty clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

Parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Typical profile:

A-0 to 4 inches; silty clay loam

Bw-4 to 15 inches; silty clay loam

Bk-15 to 22 inches; silty clay loam

Bky-22 to 60 inches; silty clay loam

Additional Components

Cambeth and similar soils: 4 percent

Delpoint and similar soils: 3 percent

Lonna and similar soils: 3 percent

Yamacall and similar soils: 3 percent

Rock outcrop, soft: 2 percent

**992F—Yawdim-Rock outcrop, soft-Cabbart association,
15 to 45 percent slopes**

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 2,600 feet

Mean annual precipitation: 12 to 16 inches

Frost-free period: 110 to 130 days

Component Description

Yawdim and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 15 to 45 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from shale and siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.5 inches

Typical profile:

A-0 to 6 inches; silty clay

C-6 to 15 inches; silty clay loam

Cr-15 to 60 inches; bedrock

Rock outcrop, soft

Composition: 30 percent

Geomorphic description: None assigned

Cabbart and similar soils

Composition: 20 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Typical profile:

A-0 to 4 inches; silt loam

Bk-4 to 13 inches; loam

Cr-13 to 60 inches; bedrock

Additional Components

Absher and similar soils: 5 percent

Fleak and similar soils: 5 percent

Gerdrum and similar soils: 5 percent

Neldore and similar soils: 5 percent

993F—Yawdim-Badland-Gerdrum association, 15 to 45 percent slopes

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 2

Landscape: Plains

Elevation: 1,900 to 2,600 feet

Mean annual precipitation: 12 to 16 inches

Frost-free period: 110 to 130 days

Component Description

Yawdim and similar soils

Composition: 30 percent

Geomorphic description: Hill

Slope: 15 to 45 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Residuum weathered from shale and siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.5 inches

Typical profile:

A-0 to 6 inches; silty clay

C-6 to 15 inches; silty clay loam

Cr-15 to 60 inches; bedrock

Badland

Composition: 30 percent

Geomorphic description: None assigned

Gerdrum and similar soils

Composition: 20 percent

Geomorphic description: Swale

Slope: 8 to 15 percent

Surface layer texture: Clay loam

Depth to restrictive feature: None noted

Drainage class: Well drained

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: Mainly 5.9 inches

Typical profile:

Ap-0 to 7 inches; clay loam

Bt_n-7 to 11 inches; silty clay loam

Bk_{nyz}-11 to 25 inches; clay

Bz-25 to 60 inches; clay loam

Additional Components

Absher and similar soils: 4 percent

Busby and similar soils: 4 percent

Fleak and similar soils: 4 percent

Vanda and similar soils: 4 percent

Yamacall and similar soils: 4 percent

**1002F—Yamacall-Rock outcrop, soft-Kobase association,
8 to 70 percent slopes**

Map Unit Setting

Interpretive focus: Rangeland

Field investigation intensity: Order 3

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Yamacall and similar soils

Composition: 35 percent
Geomorphic description: Hill
Slope: 8 to 20 percent
Surface layer texture: Loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches
Typical profile:
 A-0 to 4 inches; loam
 Bw-4 to 11 inches; loam
 Bk-11 to 48 inches; loam
 C-48 to 60 inches; loam

Rock outcrop, soft

Composition: 30 percent
Geomorphic description: None assigned

Kobase and similar soils

Composition: 15 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Silty clay loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches
Typical profile:
 A-0 to 7 inches; silty clay loam
 Bw-7 to 15 inches; silty clay loam
 Bk-15 to 31 inches; silty clay loam
 Bky-31 to 60 inches; silty clay loam

Additional Components

Cabbart and similar soils: 10 percent
 Neldore and similar soils: 5 percent
 Twilight and similar soils: 5 percent

1007F—Badland-Cambeth association, 15 to 70 percent slopes

Map Unit Setting

Interpretive focus: Rangeland (fig. 7)
Field investigation intensity: Order 3

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description

Badland

Composition: 70 percent

Geomorphic description: Hill

Cambeth and similar soils

Composition: 15 percent

Geomorphic description: Hill

Slope: 15 to 25 percent

Surface layer texture: Silt loam

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam

Bw-3 to 11 inches; silt loam

Bk-11 to 32 inches; silt loam

Cr-32 to 60 inches; bedrock



Figure 7. An area of map unit 1007F - Badland-Cambeth association, 15 to 70 percent slopes. The Badland formed in the Hell Creek Formation in northern Garfield County.

Additional Components

Abor and similar soils: 5 percent
Cabbart and similar soils: 5 percent
Neldore and similar soils: 5 percent

1017F—Busby-Twilight-Cabbart association, moist, 8 to 35 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 3
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Busby and similar soils

Composition: 5 to 40 percent
Geomorphic description: Knoll
Slope: 8 to 15 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium, eolian deposits
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 7.7 inches

Typical profile:

A-0 to 4 inches; fine sandy loam
Bw-4 to 13 inches; fine sandy loam
Bk-13 to 47 inches; fine sandy loam
C-47 to 60 inches; loamy fine sand

Twilight and similar soils

Composition: 5 to 30 percent
Geomorphic description: Hill
Slope: 15 to 25 percent
Surface layer texture: Sandy loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.0 inches

Typical profile:

A-0 to 3 inches; sandy loam
Bw-3 to 11 inches; fine sandy loam
Bk-11 to 28 inches; fine sandy loam
Cr-28 to 60 inches; bedrock

Cabbart and similar soils

Composition: 5 to 15 percent

Geomorphic description: Hill

Slope: 8 to 35 percent

Surface layer texture: Loam

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Loamy residuum weathered from calcareous siltstone

Native plant cover type: Forestland

Flooding: None

Available water capacity: Mainly 2.9 inches

Typical profile:

A-0 to 3 inches; loam

Bk-3 to 17 inches; loam

Cr-17 to 60 inches; bedrock

Additional Components

Cambeth and similar soils: 5 percent

Lonna and similar soils: 5 percent

Rock outcrop, soft: 0 to 10 percent

Rock outcrop, hard: 0 to 10 percent

1018F—Neldore-Cabbart-Blacksheep association, 15 to 60 percent slopes**Map Unit Setting**

Interpretive focus: Rangeland

Field investigation intensity: Order 3

Landscape: Plains

Elevation: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 105 to 135 days

Component Description**Neldore and similar soils**

Composition: 45 percent

Geomorphic description: Hill

Slope: 15 to 60 percent

Surface layer texture: Silty clay

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Parent material: Clayey residuum weathered from shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

Typical profile:

A-0 to 3 inches; silty clay

C1-3 to 12 inches; clay

C2-12 to 18 inches; clay

Cr-18 to 60 inches; bedrock

Cabbart and similar soils

Composition: 20 percent
Geomorphic description: Hill
Slope: 15 to 40 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches

Typical profile:

A-0 to 3 inches; silt loam
 Bk-3 to 12 inches; silt loam
 BC-12 to 17 inches; loam
 Cr-17 to 60 inches; bedrock

Blacksheep and similar soils

Composition: 15 percent
Geomorphic description: Hill
Slope: 15 to 40 percent
Surface layer texture: Fine sandy loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from sandstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.4 inches

Typical profile:

A-0 to 6 inches; fine sandy loam
 Bk-6 to 16 inches; fine sandy loam
 Cr-16 to 60 inches; bedrock

Additional Components

Abor and similar soils: 10 percent
 Rock outcrop, soft: 8 percent
 Rock outcrop, hard: 2 percent

1020F—Cambeth-Rock outcrop, soft-Yawdim association, 25 to 70 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 3
Landscape: Plains
Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Cambeth and similar soils

Composition: 40 percent
Geomorphic description: Hill
Slope: 25 to 35 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

Typical profile:

A-0 to 3 inches; silt loam
Bw-3 to 11 inches; silt loam
Bk-11 to 32 inches; silt loam
Cr-32 to 60 inches; bedrock

Rock outcrop, soft

Composition: 25 percent
Geomorphic description: None assigned

Yawdim and similar soils

Composition: 15 percent
Geomorphic description: Hill
Slope: 25 to 70 percent
Surface layer texture: Silty clay
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Residuum weathered from shale and siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.1 inches

Typical profile:

A-0 to 3 inches; silty clay
C-3 to 18 inches; silty clay loam
Cr-18 to 60 inches; bedrock

Additional Components

Cabbart and similar soils: 10 percent
Cabbart, moist and similar soils: 5 percent
Twilight and similar soils: 5 percent

1022D—Lonna-Cabbart-Cambeth association, 4 to 15 percent slopes

Map Unit Setting

Interpretive focus: Rangeland
Field investigation intensity: Order 3
Landscape: Plains

Elevation: 2,240 to 3,620 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 135 days

Component Description

Lonna and similar soils

Composition: 40 percent
Geomorphic description: Knoll
Slope: 4 to 15 percent
Surface layer texture: Silt loam
Depth to restrictive feature: None noted
Drainage class: Well drained
Parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches
Typical profile:
A-0 to 3 inches; silt loam
Bw-3 to 11 inches; silt loam
Bk-11 to 32 inches; silt loam
BC-32 to 60 inches; silty clay loam

Cabbart and similar soils

Composition: 20 percent
Geomorphic description: Knoll
Slope: 4 to 15 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches
Typical profile:
A-0 to 3 inches; silt loam
Bk-3 to 12 inches; silt loam
BC-12 to 17 inches; loam
Cr-17 to 60 inches; bedrock

Cambeth and similar soils

Composition: 20 percent
Geomorphic description: Knoll
Slope: 4 to 15 percent
Surface layer texture: Silt loam
Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches
Drainage class: Well drained
Parent material: Loamy residuum weathered from calcareous siltstone
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches
Typical profile:
A-0 to 4 inches; silt loam
Bw-4 to 14 inches; silt loam

Bk-14 to 30 inches; silt loam

Cr-30 to 60 inches; bedrock

Additional Components

Cabbart, moist and similar soils: 4 percent

Kobase and similar soils: 4 percent

Megonot and similar soils: 4 percent

Twilight and similar soils: 4 percent

Yawdim and similar soils: 4 percent

DA—Denied access

Definition: Areas where mapping access was denied by landowner.

Map Unit Setting

Mean annual precipitation: 10 to 14 inches

Frost-free period: 110 to 135 days

Component Description

Denied Access

Composition: 100 percent

Geomorphic description: None assigned

W—Water

Definition: Areas of open water.

Map Unit Setting

Mean annual precipitation: 10 to 14 inches

Frost-free period: 110 to 135 days

Component Description

Water

Composition: 100 percent

Geomorphic description: None assigned

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification.

Formation of the Soils

Each soil in the survey area is a natural, three-dimensional body on the earth's surface that supports or is capable of supporting plants. Physical and chemical processes have determined its morphology. These processes have resulted from the integration of five factors—parent material, climate, living organisms, relief and time. Differences between unlike soils can be traced to differences in one or more of these factors.

Climate

Climate, an active force in the formation of soils, is determined mainly by temperature and precipitation. Erosion and alternative freezing and thawing break down rock into material in which soils form. Water and wind are active agents in transporting and separating weathered material. 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 native vegetation that grows on the soil. Vegetation decays to produce organic matter that subsequently becomes part of the soil. Soils with cool temperatures and higher precipitation, such as the Floweree series, generally have a dark-colored surface layer; soils with warm temperatures and lower precipitation, such as the Yamacall series, generally have a light-colored surface layer. In this survey area, precipitation is 10 to 14 inches per year, and the mean annual temperature is 42 to 45 degrees F.

Living Organisms

Living organisms are active in the formation of soils. Organic matter is the main source of the dark color of the surface layer of soils. Fungi and algae are among the earliest inhabitants of rock material that contribute to the decomposition of rock. As the rock decomposes, grasses, shrubs, and trees are able to grow and support animal life.

The kinds and amounts of plants and animals present largely determine the kinds and amount of organic matter added to the soil and the manner in which this matter is incorporated into the mineral part of the soil. Roots, rodents, and insects penetrate the soil and influence its structure. Leaves, roots, and whole plants remain in the surface layer where they are changed to humus by microorganisms, chemicals in the soil, and insects.

The native vegetation in this survey area consists of short and mid grasses, forbs, and shrubs in most areas. Common rodents are gophers, prairie dogs, badgers, rabbits, and field mice. Many of the pebbles and cobbles on the surface of terraces were brought up by burrowing rodents.

Topography

Topography is determined by the uplift of mountain masses and the resistance of bedrock and geologic formations to erosion by water and wind. In the eroded uplands of this survey area, runoff water has carved deep valleys into the original bedrock. The rugged relief contrasts sharply with the smooth, low relief of the terraces and flood plains of the river valleys.

On the uplands the number, distinctness, and thickness of the soil horizons decreases as slope increases. Steep soils on which runoff is rapid have many characteristics similar to those of soils that formed in arid climates. Nearly level to moderately sloping soils that receive runoff water from soils above them have many characteristics of soils that formed in a more humid climate.

Parent Material

Many of the soils in this survey area formed in place over weakly consolidated sedimentary beds or shale. Some soils formed in alluvium and colluvium and were deposited in major valleys and on bordering uplands. Soils that formed in material derived from weakly consolidated, sandy sedimentary beds, such as those of the Yetull series are generally sandy. Soils that formed in residuum derived from shale, such as those of the Neldore series, are clayey because clay is the basic constituent of shale. Soils that formed in mixed alluvium derived from weakly consolidated loamy sedimentary beds, such as those of the Yamacall series, are loamy. Some soils in the area, such as those of the Alona series, have salt and sodium derived from the parent material. The salts and sodium make these soils saline, alkaline, or saline-alkaline and limit the kind and amount of plants that can grow on them. The density of the parent rock and its mineral composition can limit the rate of weathering and the depth of soil.

Time

The changes that take place in a soil over a long period are called soil genesis. These changes give the soil distinct layers or horizons. The kinds and arrangement of these horizons are called soil morphology and are described in terms of color, texture, structure, consistence, thickness, and permeability.

Soils can be classified according to their approximate age — from young to mature. The age, or maturity, of a soil is generally indicated by the thickness and distinctness of the subsurface horizons, the content of the organic matter and clay, the depth to which soluble material is leached, and the form and distribution of calcium carbonate and gypsum in the soil.

Havre loam, a soil of the Entisol order, is an example of a young soil. It formed in alluvium on flood plains and terraces. The soil contains little organic matter from which to form an A horizon; it has no clay accumulation; and little translocation of carbonates has occurred.

Eapa loam formed in a parent material similar to but much older than that of the Havre soil. Eapa soils formed in alluvium on terraces and are mature soils of the Mollisol order. They contain enough organic matter to have a dark surface horizon. They also have a distinct clay accumulation in a Bt horizon, and nearly all the carbonates have been leached below a depth of 10 inches.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999). 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 "Classification of the Soils" table shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve 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 Aquoll (*Aqu*, meaning water, 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 Endoaquolls (*Endo*, meaning within, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic 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 Endoaquolls.

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, mesic Typic Endoaquolls.

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 substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetical order.

Characteristics of the soil and the material in which it formed are identified for each 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 (Soil Survey Staff, 1993). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (USDA-NRCS, 1999) and Keys to Soil Taxonomy (Soil Survey Staff, 1998). Effervescence refers to disseminated lime throughout the horizon. Following the pedon description is the range of important characteristics of the soil series.

Abor Series

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Badlands, hills, and knolls on plains

Parent material: Residuum weathered from shale

Slope range: 0 to 45 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Aridic Leptic Haplusterts

Typical pedon: 1,300 feet south and 1,400 feet west of the northeast corner of sec. 7, T. 9 N., R. 46 E.

A—0 to 5 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bss—5 to 11 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many fine and very fine pores; few slickensides; slightly effervescent; moderately alkaline; clear smooth boundary.

Bky—11 to 23 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many fine and very fine pores; many fine carbonate masses; few fine gypsum masses; strongly effervescent; strongly alkaline; clear smooth boundary.

Cr—23 to 60 inches; light brownish gray (10YR 6/2) semiconsolidated shale light gray (10YR 7/2) moist.

Range in Characteristics

Depth to Bk horizon: 10 to 20 inches

Depth to bedrock: 20 to 40 inches, but mainly 25 to 35 inches

Note: These soils have cracks which extend to the paralithic contact and are as wide as 1/4 inch to 3 inches at the surface and are open for 150 days or less.

A horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, or 4

Note: The 1 chromas are lithochromic from the parent material.

Bss 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

Bky horizon:

Hue: 2.5Y, 5Y, 10YR, or 2.5YR

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

Absher Series

Depth to restrictive feature: Natric: 1 to 8 inches

Drainage class: Moderately well drained and well drained

Landform: Alluvial fans, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 15 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Leptic Torrertic Natrustalfs

Typical pedon: 1,600 feet west and 2,300 feet south of the northeast corner of sec. 13, T. 9 N., R. 39 E.

E—0 to 2 inches; light gray (2.5Y 7/2) loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure; soft, friable, nonsticky, slightly plastic; many very fine roots; slightly alkaline; abrupt smooth boundary.

Btn1—2 to 7 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parts to strong fine angular blocky and strong medium angular blocky; very hard, firm, moderately sticky, moderately plastic; many very fine roots; common very fine pores; continuous clay films on all faces of peds; slightly alkaline; abrupt smooth boundary.

Btn2—7 to 13 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parts to moderate medium angular blocky; very hard, firm, moderately sticky, moderately plastic; many very fine roots; common very fine tubular pores; patchy clay films on vertical faces of peds; moderately alkaline; abrupt smooth boundary.

Bk_{yz}—13 to 30 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine pores; common fine salt and gypsum masses; strongly effervescent; moderately alkaline; clear smooth boundary.

Bz₁—30 to 50 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, slightly sticky, moderately plastic; few very fine roots; common very fine pores; few fine salt masses; strongly effervescent; strongly alkaline; clear smooth boundary.

Bz₂—50 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky, very plastic; few very fine roots; common medium threadlike salt crystals; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to gypsum or other salts: less than 16 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: fine sandy loam, loam, or silt loam, (where mixed with the Bt horizon, textures are mainly clay loam or silty clay loam)

B_{tn} horizon:

Hue: 2.5Y, 7.5YR, or 10YR

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

Chroma: 1, 2, or 3

Texture: clay loam, silty clay, or clay

B_{k_{yz}} horizon:

Hue: 5Y, 2.5Y, 10YR, or 7.5YR

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

Chroma: 2, 3, or 4

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

B_z horizon:

Hue: 5Y, 2.5Y, 10YR, or 7.5YR

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

Chroma: 2, 3, or 4

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

Alona Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, drainageways, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Aridic Haplustepts

Typical pedon: 1,500 feet north and 1,400 feet west of the southeast corner of sec. 12, T. 12 N., R. 47 E.

- A—0 to 4 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.
- Bw—4 to 10 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parts to moderate medium subangular blocky; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; common fine and very fine pores; violently effervescent; moderately alkaline; gradual smooth boundary.
- Bk—10 to 19 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; moderate coarse subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; many fine roots; common fine and very fine pores; common carbonate masses; violently effervescent; strongly alkaline; gradual smooth boundary.
- Bz1—19 to 43 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; few fine pores; few fine salt masses; strongly effervescent; very strongly alkaline; clear smooth boundary.
- Bz2—43 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; few fine pores; few medium irregular salt masses; strongly effervescent; very strongly alkaline.

Range in Characteristics

Depth to accumulated carbonates: 6 to 18 inches

A horizon:

Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 3, 4, or 5 moist
Chroma: 2 or 3

Bw horizon:

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

Bk horizon:

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

Bz horizon:

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

Antwerp Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 4 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, calcareous, frigid Aridic Ustorthents

Typical pedon: 600 feet north and 30 feet west of the southeast corner of sec. 28,
T. 9 N., R. 40 E.

- A—0 to 1 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak thin platy structure; slightly hard, friable, slightly sticky, moderately plastic; common fine and very fine roots; common very fine tubular pores; strongly alkaline; abrupt smooth boundary.
- Bw—1 to 6 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure; hard, friable, moderately sticky, moderately plastic; common fine and very fine roots; common very fine irregular pores; strongly effervescent; very strongly alkaline; abrupt smooth boundary.
- Bz1—6 to 15 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine irregular pores; many fine salt masses; strongly effervescent; strongly alkaline; clear smooth boundary.
- Bz2—15 to 24 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak fine granular structure; slightly hard, friable, slightly sticky, moderately plastic; few very fine roots; few very fine irregular pores; common medium salt masses; strongly effervescent; moderately alkaline; gradual irregular boundary.
- BC—24 to 60 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, friable, slightly sticky, slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

A horizon:

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Bw horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: silt loam or silty clay loam

Bz horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: silt loam or silty clay loam

BC horizon:

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: silt loam or silty clay loam

Archin Series

Depth to restrictive feature: Natric: 5 to 14 inches

Drainage class: Well drained

Landform: Alluvial fans on plains

Parent material: Loamy alluvium, sandy alluvium

Slope range: 2 to 8 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Natrustalfs

Typical pedon: 650 feet east and 1,700 feet south of the northwest corner of sec. 14, T. 3 N., R. 56 E.

- A—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine pores; neutral; clear smooth boundary.
- E—4 to 7 inches; very pale brown (10YR 7/3) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure parts to weak fine granular; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; few fine and common very fine pores; neutral; abrupt smooth boundary.
- Btn—7 to 20 inches; light yellowish brown (2.5Y 6/4) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parts to strong medium subangular blocky; hard, very firm, very sticky, moderately plastic; common fine and very fine roots; many very fine pores; many faint clay films on surfaces along pores and on all faces of peds; moderately alkaline; clear smooth boundary.
- Bky—20 to 28 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; moderate coarse and medium subangular blocky structure; slightly hard, firm, slightly sticky, moderately plastic; few very fine roots; common fine and medium carbonate masses; common fine gypsum nests; violently effervescent; strongly alkaline; clear smooth boundary.
- BC—28 to 34 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky, slightly plastic; strongly effervescent; strongly alkaline; gradual smooth boundary.
- C—34 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky, slightly plastic; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to accumulated carbonates: 10 to 30 inches

Depth to gypsum or other salts: 16 and 24 inches

Note: The combined A and E horizon thickness ranges from 5 to 14 inches.

A horizon:

Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 3 or 4 moist
Chroma: 1, 2, 3, or 4

E horizon:

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 3, 4, or 5 moist
Chroma: 1, 2, 3, or 4

Btn horizon:

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

Bky 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: fine sandy loam, loam, sandy clay loam, or clay loam

BC 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: fine sandy loam, loam, sandy clay loam, or clay loam

C 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: fine sandy loam, loam, sandy clay loam, or clay loam

Armells Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Terraces on plains

Parent material: Colluvium derived from porcelanite

Slope range: 25 to 35 percent

Elevation range: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Loamy-skeletal, mixed, superactive, calcareous, frigid Aridic
Ustorthents

Typical pedon: 2,000 feet east and 120 feet south of the northwest corner of sec. 8,
T. 4 S., R. 44 E.

A—0 to 4 inches; reddish brown (5YR 5/3) channery loam, dark reddish brown (5YR 3/3) moist; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 30 percent channers; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—4 to 18 inches; reddish brown (5YR 5/3) extremely channery loam, reddish brown (5YR 4/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; common very fine roots around fragments; many distinct carbonate coats on bottom surfaces of rock fragments; 5 percent flagstones and 60 percent channers; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—18 to 30 inches; reddish brown (2.5YR 5/4) extremely channery loam, red (2.5YR 4/6) moist; massive; soft, very friable, slightly sticky, slightly plastic; few very fine roots; common faint carbonate coats on bottom surfaces of rock fragments; 5 percent flagstones and 60 percent channers; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk3—30 to 60 inches; red (2.5YR 5/6) extremely channery loam, red (2.5YR 4/6) moist; massive; soft, very friable, slightly sticky, slightly plastic; few very fine roots; common faint carbonate coats on lower surfaces of rock fragments; 5 percent flagstones and 60 percent channers; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to accumulated carbonates: 3 to 7 inches

Note: The surface when mixed to a depth of 7 inches does not meet the requirements of a mollic epipedon.

A horizon:

Hue: 2.5YR, 5YR, or 7.5YR

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2, 3, or 4

Rock fragments: 15 to 45 percent—0 to 15 percent flagstones; 5 to 30 percent channers

Bk1 horizon:

Hue: 2.5YR, 5YR, or 7.5YR

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

Chroma: 3, 4, 5, or 6

Texture: fine sandy loam or loam

Rock fragments: 35 to 80 percent—0 to 10 percent flagstones; 35 to 70 percent channers

Bk2 horizon:

Hue: 2.5YR, 5YR, or 7.5YR

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

Chroma: 3, 4, 5, or 6

Texture: fine sandy loam or loam

Rock fragments: 35 to 80 percent—0 to 10 percent flagstones; 35 to 70 percent channers

Bk3 horizon:

Hue: 2.5YR, 5YR, 7.5YR, or 10YR

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

Chroma: 3, 4, 5, or 6

Texture: fine sandy loam or loam

Rock fragments: 35 to 80 percent—0 to 10 percent flagstones; 35 to 70 percent channers

Arsite Series

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Landform: Hills on plains

Parent material: Residuum weathered from shale

Slope range: 2 to 15 percent

Elevation range: 2,600 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Clayey, smectitic, nonacid, frigid, shallow Aridic Ustorthents

Typical pedon: 2,100 feet south and 550 feet east of the northwest corner of sec. 9, T. 2 S., R. 58 E.

- A—0 to 2 inches; light brownish gray (10YR 6/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; strong fine subangular blocky structure; .5 inch thick vesicular crust on surface; slightly hard, very friable, slightly sticky, slightly plastic; common fine and very fine roots; neutral; clear wavy boundary.
- Cyz1—2 to 6 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; strong coarse prismatic structure; hard, firm, moderately sticky, moderately plastic; common fine and very fine roots; common fine gypsum masses; few fine salt masses; slightly acid; clear wavy boundary.
- Cyz2—6 to 12 inches; light brownish gray (10YR 6/2) clay, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, firm, moderately sticky, moderately plastic; common fine and very fine roots; few fine salt masses; common medium gypsum crystals; moderately acid; clear wavy boundary.
- Cr—12 to 60 inches; grayish brown (10YR 5/2) semiconsolidated shale, very dark grayish brown (10YR 3/2) moist; slightly acid.

Range in Characteristics

Depth to bedrock: 10 to 20 inches

A horizon:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Cyz1 horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: silty clay or clay

Note: The dark colors are lithochromic from the parent material.

Cyz2 horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: silty clay or clay

Note: The dark colors are lithochromic from the parent material.

Attewan Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans and stream terraces on plains

Parent material: Gravelly alluvium

Slope range: 0 to 4 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Aridic Argiustolls

Typical pedon: 1,500 feet west and 700 feet south of the northeast corner of sec. 3, T. 12 N., R. 26 E.

- A—0 to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, very plastic; many fine and medium roots; 5 percent gravel; neutral; clear smooth boundary.
- Bt—3 to 12 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parts to moderate medium angular blocky; hard, firm, moderately sticky, moderately plastic; common fine roots; common fine tubular pores; common distinct clay films on all faces of peds; 5 percent gravel; slightly alkaline; clear smooth boundary.
- Bk1—12 to 15 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parts to moderate medium subangular blocky; hard, firm, moderately sticky, moderately plastic; common fine roots; common fine tubular pores; common fine carbonate masses; 5 percent gravel; violently effervescent; moderately alkaline; clear smooth boundary.
- Bk2—15 to 30 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, firm, moderately sticky, moderately plastic; few fine roots; common fine tubular pores; many fine and medium carbonate masses; 5 percent gravel; violently effervescent; moderately alkaline; clear wavy boundary.
- 2C—30 to 60 inches; light yellowish brown (10YR 6/4) very gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, loose, nonsticky, nonplastic; 50 percent gravel; violently effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 12 inches and may include part or all of the argillic horizon

Depth to carbonate accumulations: 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

Bt horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3; chroma of 4 allowed in the lower part.

Texture: loam, sandy clay loam, or clay loam

Rock fragments: 0 to 25 percent—0 to 5 percent greater than 3 inch stones and cobbles; 0 to 20 percent gravel

Bk horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, 4, or 6

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

Rock fragments: 0 to 30 percent—0 to 5 percent stones and cobbles; 0 to 25 percent gravel

2C horizon:

Hue: 2.5Y or 10YR

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

Chroma: 2, 3, or 4

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

Rock fragments: 35 to 75 percent—0 to 15 percent stones and cobbles; 35 to 60 percent gravel

Bascovy Series

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Hills and knolls on plains

Parent material: Residuum weathered from clayey shale

Slope range: 2 to 25 percent

Elevation range: 1,900 to 2,600 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Fine, smectitic, frigid Aridic Leptic Haplusterts

Typical pedon: 2,200 feet west and 1,960 feet south of the northeast corner of sec. 14, T. 26 N., R. 41 E.

A—0 to 2 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate very fine angular blocky structure; hard, friable, moderately sticky, moderately plastic; many fine roots; slightly acid; clear wavy boundary.

Bss1—2 to 11 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine subangular blocky structure; very hard, firm, very sticky, very plastic; many fine roots; neutral; gradual wavy boundary.

Bss2—11 to 23 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, moderately sticky, moderately plastic; common fine roots in cracks; 45 percent soft shale fragments; neutral; gradual smooth boundary.

Cr1—23 to 47 inches; olive gray (5Y 5/2) very dark gray (5Y 3/1) moist; semiconsolidated shale; strongly acid; clear smooth boundary.

Cr2—47 to 60 inches; gray (5Y 5/1) very dark gray (5Y 3/1) moist; semiconsolidated shale; strongly acid.

Range in Characteristics

Depth to bedrock: 20 to 40 inches

Note: A Bw horizon is allowed. These soils have cracks which extend to the paralithic

contact and are as wide as 1/4 inch to 3 inches at the surface and are open for 150 days or less.

A horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, or 3

Note: The chroma of 1 is lithochromic from the parent material.

Bss horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, or 3

Texture: silty clay or clay

Note: The chroma of 1 is lithochromic.

Benz Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans and stream terraces on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 1,900 to 2,600 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Fine-loamy, mixed, superactive, calcareous, frigid Aridic Ustorthents

Typical pedon: 1,020 feet east and 2,340 feet north of the southwest corner of sec. 23, T. 23 N., R. 43 E.

A—0 to 1 inches; light brownish gray (2.5Y 6/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; slightly effervescent; strongly alkaline; clear wavy boundary.

C1—1 to 9 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, moderately sticky, moderately plastic; slightly effervescent; strongly alkaline; clear wavy boundary.

C2—9 to 60 inches; grayish brown (2.5Y 5/2) stratified fine sandy loam to clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, moderately sticky, moderately plastic; 5 percent rock fragments; slightly effervescent; strongly alkaline.

Range in Characteristics

A horizon:

Hue: 2.5Y or 10YR

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

Chroma: 2 or 3

Note: The surface is crusted and hard or very hard when dry.

C horizon:

Hue: 5Y, 2.5Y, or 10YR

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

Chroma: 2 or 3

Texture: fine sandy loam, loam, silt loam, or clay loam with strata of sandy loam, silt, and silty clay loam

Big Sandy Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Poorly drained

Landform: Drainageways on plains, flood plains in valleys

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-loamy, mixed, superactive, calcareous, frigid Typic Fluvaquents

Typical pedon: 2,000 feet north and 1,850 feet west of the southeast corner of sec. 22, T. 8 N, R. 52 E.

A—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure parts to strong fine and medium granular; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

C—3 to 14 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; slightly hard, friable, moderately sticky, moderately plastic; common fine and medium roots; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg1—14 to 30 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, firm, moderately sticky, moderately plastic; common fine and very fine roots; common medium and fine distinct yellowish brown (10YR 5/4) iron-manganese concretions; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg2—30 to 60 inches; gray (5Y 5/1) stratified very fine sandy loam to clay loam to loam, dark gray (5Y 4/1) moist; massive; hard, firm, moderately sticky, moderately plastic; common very fine roots; common medium and fine distinct light yellowish brown (10YR 6/4) iron-manganese concretions and common medium faint gray (5Y 5/1) iron depletions; common fine and medium irregular carbonate masses; 10 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

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

Chroma: 1 or 2

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

C horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Texture: loam or silty clay loam, with strata of fine sandy loam, silt loam, or clay loam

Cg1 horizon:

Hue: 5Y, 2.5Y, or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Texture: loam or silty clay loam with strata of fine sandy loam, silt loam, or clay loam

Cg2 horizon:

Hue: 5Y, 2.5Y, or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Texture: loam, silt loam, clay loam, or silty clay loam with strata of fine sand, loamy sand, fine sandy loam, silt loam, or clay

Birney Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Hills on plains

Parent material: Colluvium derived from porcelanite

Slope range: 15 to 25 percent

Elevation range: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Loamy-skeletal, mixed, superactive, frigid Aridic Haplustepts

Typical pedon: 2,250 feet east and 550 feet north of the southwest corner of sec. 14, T. 3 S., R. 44 E.

A—0 to 5 inches; reddish brown (5YR 5/4) channery loam, reddish brown (5YR 4/4) moist; weak thick platy structure; soft, very friable, slightly sticky, slightly plastic; many fine and very fine roots; 15 percent channers; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw—5 to 11 inches; reddish brown (5YR 5/3) channery loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure parts to weak fine granular; soft, very friable, slightly sticky, slightly plastic; many very fine roots; common very fine tubular pores; 20 percent channers; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—11 to 29 inches; light reddish brown (5YR 6/4) extremely channery sandy loam, reddish brown (5YR 5/4) moist; weak fine granular structure; hard, very friable, slightly sticky, nonplastic; common fine and very fine roots around fragments; many carbonate masses on bottom of rock fragments; 50 percent channers and 15 percent flagstones; violently effervescent; strongly alkaline; gradual wavy boundary.

Bk2—29 to 60 inches; reddish yellow (5YR 6/6) extremely channery sandy loam, yellowish red (5YR 4/6) moist; massive; soft, very friable, slightly sticky, nonplastic; few fine roots; many carbonate masses on bottom of rock fragments; 45 percent channers and 20 percent flagstones; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonate accumulations: 10 to 15 inches

Note: A C horizon is allowed.

A horizon:

Hue: 5YR, 7.5YR, or 10YR

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

Chroma: 2, 3, or 4

Rock fragments: 0 to 35 percent channers

Bw horizon:

Hue: 5YR, 7.5YR, or 10YR

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

Chroma: 2, 3, 4, or 6

Texture: sandy loam or loam

Rock fragments: 0 to 35 percent channers or gravel

Bk horizons:

Hue: 5YR, 7.5YR, or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, 4, or 6

Texture: sandy loam, fine sandy loam, or loam

Rock fragments: 35 to 80 percent—0 to 20 percent flagstones, 35 to 60 percent channers or gravel

Blacksheep Series

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Landform: Hills and knolls on plains

Parent material: Residuum weathered from sandstone

Slope range: 2 to 70 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Loamy, mixed, superactive, calcareous, frigid, shallow Aridic Ustorthents

Typical pedon: 1,500 feet north and 1,200 feet east of the southwest corner of sec. 32, T. 2 N., R. 46 E.

A—0 to 6 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; common fine and very fine roots; common very fine tubular pores; slightly alkaline; clear smooth boundary.

Bk—6 to 16 inches; light gray (2.5Y 7/2) very fine sandy loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parts to weak fine subangular blocky; soft, very friable, nonsticky, nonplastic; common fine and very fine roots; few fine and common very fine tubular pores; few medium carbonate masses; violently effervescent; moderately alkaline; clear smooth boundary.

Cr—16 to 60 inches; light gray (10YR 7/2); weakly consolidated sandstone; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to bedrock: 10 to 20 inches

A horizon:

Hue: 2.5Y, 7.5YR, or 10YR

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

Chroma: 2 or 3

Bk horizon:

Hue: 2.5Y, 7.5YR, or 10YR

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

Chroma: 2, 3, or 4

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

Bonfri Series

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Hills on plains

Parent material: Residuum weathered from sandstone and shale

Slope range: 4 to 8 percent

Elevation range: 2,800 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Haplustalfs

Typical pedon: 200 feet west and 80 feet north of the southeast corner of sec. 12, T. 2 S., R. 20 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, friable, nonsticky, nonplastic; neutral; clear wavy boundary.

Bt—7 to 23 inches; grayish brown (10YR 5/2) clay loam, brown (10YR 4/3) moist; weak prismatic structure parts to moderate fine subangular blocky and moderate medium subangular blocky; slightly hard, friable, moderately sticky, moderately plastic; few fine and very fine roots; few fine and very fine pores; common faint clay films on all faces of peds; neutral; gradual wavy boundary.

Bk1—23 to 28 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine prismatic structure; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots; few very fine pores; many carbonate masses around rock fragments and many fine carbonate masses; 1 percent sandstone fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—28 to 36 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine pores; many carbonate masses around rock fragments and common fine carbonate masses; 5 percent sandstone fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—36 to 60 inches; semiconsolidated interbedded sandstone and shale.

Range in Characteristics

10 to 40 inch particle-size control section: 27 to 35 percent clay and less than 35 percent fine and coarser sand

Depth to carbonate accumulations: 13 to 30 inches

Depth to bedrock: 20 to 40 inches

A horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Bt horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

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

Bk horizons:

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: loam, sandy clay loam, or clay loam

Brunelda Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, depressions, swales, and stream terraces on plains

Parent material: Alluvium derived from shale

Slope range: 0 to 8 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Torreritic Haplustepts

Typical pedon: 2,640 feet east and 1,500 feet north of the southwest corner of sec. 23, T. 11 N., R. 35 E.

A—0 to 1 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate very fine granular structure; slightly hard, friable, moderately sticky, moderately plastic; many very fine roots; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—1 to 6 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium angular blocky structure parts to moderate fine angular blocky and moderate very fine angular blocky; hard, firm, moderately sticky, moderately plastic; many very fine roots; many very fine pores; few fine carbonate masses; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Byz1—6 to 13 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parts to moderate medium angular blocky; very hard, firm, very sticky, very plastic; common very fine roots; common very fine pores; many fine gypsum masses; slightly effervescent; slightly alkaline; clear smooth boundary.

Byz2—13 to 40 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky, very plastic; few very fine roots; common very fine pores; common fine gypsum masses; strongly alkaline; gradual smooth boundary.

BC—40 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky, very plastic; few very fine pores; slightly alkaline.

Range in Characteristics

Depth to Byz1 horizon: 1 to 10 inches

Depth to Byz2 horizon: 10 to 20 inches

A horizon:

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Bw horizon:

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay or clay

Byz1 horizon:

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay or clay

Byz2 horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: silty clay or clay

Notes: This horizon remains moist in some part throughout the growing season.

Iron stains, 10YR 5/4 through 5/8 moist, are present in some pedons. The chroma of 1 is lithochromic from parent materials.

BC horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, or 3

Texture: silty clay or clay

Notes: Some part of this horizon remains moist throughout the growing season.

Iron stains, 10YR 5/4 through 5/8 moist, are present in some pedons. The chroma of 1 is lithochromic from parent materials.

Brushton Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Aridic Argiustolls

Typical pedon: 800 feet north and 150 feet east of the southwest corner of sec. 4, T. 6 N., R. 46 E.

- Ap—0 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parts to moderate coarse and moderate medium granular; soft, friable, moderately sticky, slightly plastic; many fine and very fine roots; slightly alkaline; clear smooth boundary.
- Bt1—6 to 12 inches; brown (10YR 4/3) silty clay loam, dark brown (10YR 3/3) moist; moderate coarse prismatic structure parts to strong fine and medium angular blocky; hard, firm, moderately sticky, moderately plastic; many fine and very fine roots; common fine and very fine pores; very few faint clay films on all faces of peds; slightly alkaline; clear wavy boundary.
- Bt2—12 to 18 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parts to strong medium angular blocky; very hard, firm, moderately sticky, moderately plastic; many fine and very fine roots; common fine and very fine pores; very few faint clay films on all faces of peds; slightly alkaline; gradual wavy boundary.
- Bk1—18 to 28 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate coarse prismatic structure parts to moderate coarse subangular blocky; hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine pores; common fine and medium carbonate masses; violently effervescent; moderately alkaline; clear wavy boundary.
- Bk2—28 to 36 inches; pale brown (10YR 6/3) silt loam, grayish brown (10YR 5/2) moist; moderate coarse prismatic structure; hard, firm, slightly sticky, slightly plastic; common very fine roots; common fine and very fine pores; common fine carbonate masses; violently effervescent; moderately alkaline; gradual wavy boundary.
- BC—36 to 60 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; soft, friable, slightly sticky, slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches; in some pedons it includes all or only the upper part of the Bt horizon

Depth to carbonate accumulations: 10 to 24 inches

A horizon:

Hue: 2.5Y or 10YR

Chroma: 2 or 3

Bt horizon:

Hue: 2.5Y or 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Bk horizon:

Hue: 2.5Y or 10YR

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

Chroma: 2, 3, or 4

Texture: loam or silt loam

BC horizon:

Hue: 2.5Y or 10YR

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

Chroma: 2, 3, or 4

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

Bullock Series

Depth to restrictive feature: Natric: 2 to 7 inches; Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Hills and knolls on plains

Parent material: Residuum weathered from sandstone and shale

Slope range: 1 to 8 percent

Elevation range: 2,600 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Leptic Natrustalfs

Typical pedon: 1,600 feet west and 1,700 feet north of the southeast corner of sec. 27, T. 8 N., R. 57 E.

E—0 to 2 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure parts to single grain; soft, very friable, nonsticky, nonplastic; many very fine roots; slightly alkaline; abrupt smooth boundary.

Btn—2 to 10 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium columnar structure parts to moderate medium subangular blocky; very hard, very firm, very sticky, very plastic; many very fine roots; few faint clay films on all faces of peds; moderately alkaline; clear smooth boundary.

Bkz—10 to 25 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; common very fine roots; few fine salt crystals; few fine carbonate masses; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—25 to 33 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, moderately sticky, moderately plastic; few very fine roots; few fine gypsum masses; few fine salt masses; strongly effervescent; strongly alkaline; gradual wavy boundary.

Cr—33 to 60 inches; grayish brown (2.5Y 5/2) semiconsolidated sandstone and shale, dark grayish brown (2.5Y 4/2) moist.

Range in Characteristics

Depth to carbonate accumulations: 5 to 11 inches

Depth to gypsum or other salts: 5 to 15 inches

Depth to bedrock: 20 to 40 inches

A horizon:

Hue: 10YR or 2.5Y

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

Chroma: 1 or 2

Texture: fine sandy loam or clay loam

Btn horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: loam, sandy clay loam, or clay loam

Bkz horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, or 4

Texture: sandy loam, loam, sandy clay loam, or clay loam

C horizon:

Hue: 2.5Y or 5Y

Value: 4, 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist

Chroma: 2, 3, or 4

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

Busby Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, hills, interdunes, knolls, stream terraces, and swales on plains

Parent material: Alluvium; eolian deposits

Slope range: 0 to 25 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Coarse-loamy, mixed, superactive, frigid Haplocalcidic Haplustepts

Typical pedon: 1,900 feet west and 2,200 feet north of the southeast corner of sec. 24, T. 1 S., R. 41 E.

A—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium platy structure; slightly hard, very friable, nonsticky, slightly plastic; many fine and very fine roots; many very fine tubular pores; slightly alkaline; clear smooth boundary.

Bw—4 to 13 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; moderate medium and coarse prismatic structure parts to weak coarse subangular blocky; slightly hard, very friable, nonsticky, slightly plastic; common fine and very fine roots; common very fine tubular pores; slightly alkaline; clear smooth boundary.

Bk1—13 to 26 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure; soft, very friable, nonsticky, slightly plastic; common very fine roots; common very fine pores; few fine carbonate masses; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—26 to 47 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; structureless massive; slightly hard, very friable, nonsticky, slightly plastic; few very fine roots; few very fine tubular pores; few fine and medium carbonate masses; strongly effervescent; moderately alkaline; clear smooth boundary.

C—47 to 60 inches; pale brown (10YR 6/3) loamy fine sand, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky, nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonate accumulations: 10 to 20 inches

A horizon:

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2, 3, or 4

Bw horizon:

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

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: sandy loam or fine sandy loam

C horizon:

Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: fine sand, loamy sand, loamy fine sand, sandy loam, or fine sandy loam
Textures of fine sand, loamy sand, and loamy fine sand are below depths of 40 inches.

Cabbart Series

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Landform: Badlands, drainageways, hills, and knolls on plains

Parent material: Loamy residuum weathered from calcareous siltstone

Slope range: 2 to 70 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Loamy, mixed, superactive, calcareous, frigid, shallow Aridic Ustorthents

Typical pedon: 200 feet west and 750 feet north of the southeast corner of sec. 21, T. 15 N., R. 27 E.

A—0 to 3 inches; olive brown (2.5Y 5/4) loam, light olive brown (2.5Y 4/4) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine and medium roots; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk—3 to 12 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common medium and many fine and very fine roots; many fine and medium carbonate masses; violently effervescent; moderately alkaline; clear smooth boundary.

BC—12 to 17 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, slightly sticky, slightly plastic; common fine and very fine roots; violently effervescent; moderately alkaline; gradual smooth boundary.

Cr—17 to 60 inches; light brownish gray (2.5Y 6/2) weakly consolidated sedimentary beds, dark grayish brown (2.5Y 4/2) moist.

Range in Characteristics

Depth to bedrock: 10 to 20 inches

Note: A C horizon is allowed.

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 or silt loam

Bk 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, silt loam, clay loam, or silty clay loam

BC horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 3 or 4

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

Cambeth Series

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Hills and knolls on plains

Parent material: Loamy residuum weathered from calcareous siltstone

Slope range: 0 to 35 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Aridic Calciusteps

Typical pedon: 1,100 feet south and 200 feet east of northwest corner of sec. 9, T. 7 N., R. 45 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; soft, friable, nonsticky, slightly plastic; common fine and medium roots; strongly effervescent; slightly alkaline; abrupt smooth boundary.

Bw—3 to 11 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; moderate medium angular blocky structure; slightly hard, friable, nonsticky, slightly plastic; common fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—11 to 20 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; moderate medium and coarse angular blocky structure; slightly

hard, friable, nonsticky, slightly plastic; common very fine and fine roots; few fine and medium carbonate masses; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—20 to 32 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak fine and medium angular blocky structure; slightly hard, friable, nonsticky, slightly plastic; common very fine and fine roots; common medium carbonate masses; violently effervescent; strongly alkaline; clear smooth boundary.

Cr—32 to 60 inches; light olive brown (2.5Y 5/4) weakly consolidated sedimentary beds, light brownish gray (2.5Y 6/2) dry.

Range in Characteristics

Depth to carbonate accumulations: 10 to 15 inches

Depth to bedrock: 20 to 40 inches

Soil phases: Noncalcareous—0 to 5 percent calcium carbonate equivalent; calcareous—5 to 10 percent calcium carbonate equivalent

A horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Bw1 horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: loam, silt loam, or silty clay loam

Bw2 horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam, silt loam, or silty clay loam

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, silt loam, or silty clay loam

Notes: This horizon may contain as much as 60 percent soft fragments in the lower part. Accumulations of gypsum may be present in some pedons; accumulations of carbonates may be absent.

Chinook Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, hills, knolls, and stream terraces on plains

Parent material: Alluvium, eolian deposits

Slope range: 0 to 15 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Coarse-loamy, mixed, superactive, frigid Aridic Haplustolls

Typical pedon: 2,580 feet west and 2,450 feet north of the southeast corner of sec. 9, T. 1 S., R. 43 E.

- A1—0 to 3 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky, nonplastic; many very fine roots; neutral; clear smooth boundary.
- A2—3 to 14 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parts to moderate medium subangular blocky; soft, very friable, nonsticky, nonplastic; many very fine roots; common very fine pores; neutral; clear wavy boundary.
- Bw—14 to 24 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; weak very coarse prismatic structure parts to weak coarse subangular blocky; soft, very friable, nonsticky, nonplastic; many very fine roots; many very fine pores; neutral; clear smooth boundary.
- Bk1—24 to 35 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; slightly effervescent; moderately alkaline; gradual smooth boundary.
- Bk2—35 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky, nonplastic; common very fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches

Depth to carbonate accumulations: 10 to 35 inches

Note: Some pedons have a BC or C horizon.

A horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: sandy loam or fine sandy loam

Bw horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: sandy loam or fine sandy loam

Bk1 horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: sandy loam or fine sandy loam

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: sandy loam or fine sandy loam

Colstrip Series

Depth to restrictive feature: Bedrock (lithic): 10 to 20 inches

Drainage class: Well drained

Landform: Hills and knolls on plains

Parent material: Residuum weathered from sandstone

Slope range: 2 to 8 percent

Elevation range: 2,600 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Loamy, mixed, superactive, calcareous, frigid Aridic Lithic Ustorthents

Typical pedon: 2,500 feet west and 2,000 feet north of the southeast corner of sec. 7, T. 6 S., R. 43 E.

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

Bw—4 to 7 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; weak medium prismatic structure parts to moderate fine and medium subangular blocky; hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine pores; 10 percent channers; strongly effervescent; slightly alkaline; clear smooth boundary.

C—7 to 16 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak very fine and fine subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine pores; 15 percent channers; strongly effervescent; moderately alkaline; abrupt smooth boundary.

R—16 to 60 inches; hard sandstone bedrock.

Range in Characteristics

Depth to bedrock: 10 to 20 inches

A horizon:

Hue: 5YR, 7.5YR, 10YR, or 2.5Y

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

Chroma: 2, 3, or 4

Bw horizon:

Hue: 5YR, 7.5YR, 10YR, or 2.5Y

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

Chroma: 2, 3, or 4

Texture: sandy loam, fine sandy loam, or loam

Rock fragments: 0 to 35 percent channers

C horizon:

Hue: 5YR, 7.5YR, 10YR, or 2.5Y

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

Chroma: 2, 3, or 4

Texture: sandy loam, fine sandy loam, or loam

Rock fragments: 0 to 35 percent channers

Creed Series

Depth to restrictive feature: Natric: 4 to 10 inches

Drainage class: Well drained

Landform: Alluvial fans and stream terraces on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Aridic Natrustalfs

Typical pedon: 400 feet west and 1,200 feet north of the southeast corner of sec. 31, T. 10 N., R. 48 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine and very fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine and very fine roots; moderately alkaline; abrupt smooth boundary.

E—3 to 7 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and thick platy structure parts to weak medium and coarse granular; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; common fine and very fine pores; moderately alkaline; abrupt smooth boundary.

Btn—7 to 15 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium columnar structure parts to strong medium angular blocky; very hard, very firm, very sticky, very plastic; common very fine roots; common very fine tubular pores; continuous very dark gray (10YR 3/1) clay films on all faces of peds and continuous very dark gray (10YR 3/1) clay films on surfaces along pores and continuous skeletons on tops of columns; strongly alkaline; clear smooth boundary.

Bky—15 to 28 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong coarse prismatic structure parts to strong coarse angular blocky; very hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine tubular pores; common fine threadlike gypsum crystals; common medium carbonate masses; strongly effervescent; strongly 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; moderate coarse prismatic structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine tubular pores; common fine and medium threadlike gypsum crystals; slightly effervescent; strongly alkaline.

Range in Characteristics

Depth to carbonate accumulations: 10 to 20 inches

Depth to gypsum or other salts: 16 to 30 inches

A horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

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

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, silty clay, or clay

Bky horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

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

By 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 clay loam, or clay loam

Davidell Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 2,240 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Haplargidic Natrustalfs

Typical pedon: 2,000 feet west and 1,500 feet south of the northeast corner of sec. 19, T. 9 N., R. 40 E.

E1—0 to 2 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate thin platy structure; soft, friable, nonsticky, nonplastic; many very fine roots; many fine irregular pores; slightly alkaline; abrupt smooth boundary.

E2—2 to 4 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure parts to weak medium platy; slightly hard, friable, nonsticky, nonplastic; many very fine roots; many very fine tubular pores; slightly alkaline; clear smooth boundary.

Bt—4 to 9 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parts to strong fine angular blocky; hard, firm, moderately sticky, moderately plastic; many very fine roots; few very fine tubular pores; many faint clay films on surfaces along pores and on all faces of peds; slightly alkaline; abrupt smooth boundary.

Bk1—9 to 25 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; few very fine tubular pores; few fine carbonate masses; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—25 to 38 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky, moderately plastic; few very fine roots; few very fine tubular pores; few fine carbonate masses; strongly effervescent; moderately alkaline; clear smooth boundary.

Byz—38 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; few fine salt masses; few fine gypsum masses; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to carbonate accumulations: 6 to 14 inches

E horizons:

Hue: 2.5Y or 10YR

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: loam, silt loam, or silty clay loam

Bt horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: clay loam or silty clay loam

Bk horizons:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: clay loam or silty clay loam

Byz horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

Delpoint Series

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Badlands, alluvial fans, hills, and knolls on plains

Parent material: Loamy residuum

Slope range: 0 to 70 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Haplustepts

Typical pedon: 1,400 feet west and 1,750 feet north of the southeast corner of sec. 18, T. 15 N., R. 27 E.

A—0 to 3 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; neutral; clear smooth boundary.

Bw—3 to 12 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; slightly effervescent; neutral; gradual smooth boundary.

Bk—12 to 28 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; common fine carbonate masses; violently effervescent; moderately alkaline; gradual smooth boundary.

Cr—28 to 60 inches; light gray (10YR 7/1) weakly consolidated sedimentary beds.

Range in Characteristics

Depth to carbonate accumulations: 10 to 20 inches

Depth to bedrock: 20 to 40 inches

A horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

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

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: sandy loam, loam, clay loam, or silty clay loam

Eapa Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, knolls, swales, and stream terraces on plains

Parent material: Loamy alluvium

Slope range: 0 to 8 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Argiustolls

Typical pedon: 950 feet north and 300 feet east of the southwest corner of sec. 10, T. 4 N., R. 61 E.

Ap—0 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular pores; neutral; clear smooth boundary.

Bt1—8 to 16 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/2) moist; strong coarse prismatic structure parts to strong medium subangular blocky; hard, friable, moderately sticky, moderately plastic; many very fine roots; many very fine tubular pores; common faint clay films on all faces of peds and on surfaces along pores; neutral; clear smooth boundary.

Bt2—16 to 24 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parts to strong medium

subangular blocky; hard, firm, very sticky, moderately plastic; common very fine roots; common very fine tubular pores; common faint clay films on all faces of peds and on surfaces along pores; slightly alkaline; clear smooth boundary.

Bk1—24 to 32 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; strong medium prismatic structure parts to moderate medium subangular blocky; hard, firm, very sticky, moderately plastic; few very fine roots; common very fine tubular pores; many fine and medium carbonate masses; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—32 to 60 inches; gray (10YR 6/1) clay loam, gray (10YR 5/1) moist; weak coarse prismatic structure; hard, firm, very sticky, very plastic; few fine tubular pores; many fine and medium carbonate masses; violently effervescent; strongly alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches

Depth to carbonate accumulations: 15 to 30 inches

Note: Some pedons have a BC or C horizon.

A horizon:

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 1 or 2

Bt horizons:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam or clay loam

Bk horizons:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, or 4

Texture: loam, sandy clay loam, or clay loam

Endoaquents Taxon above family

Depth to restrictive feature: Greater than 60 inches

Drainage class: Poorly drained

Landform: Depression on plains

Parent material: Alluvium

Slope range: 0 to 6 percent

Elevation range: 2,700 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Loamy Endoaquents

Typical pedon: 3,090 feet north and 500 feet east of the southwest corner of sec. 33, T. 14 N., R. 34 E.

E—0 to 2 inches; light gray (2.5Y 7/2) silty clay loam, light brownish gray (2.5Y 6/2) moist; massive; hard, friable, slightly sticky, slightly plastic; few fine and many very fine roots throughout; strongly effervescent; slightly alkaline; clear wavy boundary.

- C—2 to 12 inches; light gray (2.5Y 7/1) silty clay loam, gray (2.5Y 5/1) moist; massive; hard, friable, slightly sticky, slightly plastic; few very fine roots; common medium distinct irregular yellowish brown (10YR 5/6) masses of oxidized iron; strongly effervescent; slightly alkaline; clear wavy boundary.
- Cg—12 to 60 inches; gray (2.5Y 5/1) loam, dark gray (2.5Y 4/1) moist; massive; very hard, friable, slightly sticky, slightly plastic; common medium prominent irregular strong brown (7.5YR 4/6) and (7.5YR 5/6) moist masses of oxidized iron; slightly alkaline.

Range in Characteristics

Salinity: Greater than 16 mmhos/cm

Ethridge Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Torric Argiustolls

Typical pedon: 400 feet north and 1,500 feet east of the southwest corner of sec. 12, T. 9 N., R. 56 E.

- Ap—0 to 5 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) moist; strong fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; many very fine irregular pores; neutral; abrupt smooth boundary.
- Bt—5 to 12 inches; brown (10YR 5/3) silty clay, dark brown (10YR 3/3) moist; strong medium subangular blocky structure parts to strong fine angular blocky; hard, firm, moderately sticky, moderately plastic; few very fine roots; common fine tubular pores; common faint clay films on surfaces along root channels and continuous distinct clay films on all faces of peds; slightly alkaline; clear wavy boundary.
- Bk—12 to 27 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parts to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; many very fine tubular pores; common fine carbonate masses; strongly effervescent; moderately alkaline; clear wavy boundary.
- Bky—27 to 38 inches; very pale brown (10YR 7/3) silty clay loam, brown (10YR 5/3) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; common medium and many very fine tubular pores; few fine gypsum crystals; common fine carbonate masses; violently effervescent; moderately alkaline; clear wavy boundary.
- BC—38 to 60 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 14 inches and may include all or only part of the Bt horizon

Depth to carbonate accumulations: 10 to 24 inches

A horizon:

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Texture: loam or silty clay loam

Bt horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

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

Bk horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

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

Bky horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

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

BC 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, clay loam, or silty clay loam

Fleak Series

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Somewhat excessively drained

Landform: Hills and knolls on plains

Parent material: Residuum weathered from calcareous sandstone

Slope range: 2 to 45 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 16 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Mixed, frigid, shallow Aridic Ustipsamments

Typical pedon: 1,655 feet south and 475 feet east of the northwest corner of sec. 7, T. 25 N., R. 43 E.

A1—0 to 3 inches; olive brown (2.5Y 4/4) sandy loam, very dark grayish brown (2.5Y 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many fine roots; 5 percent weakly cemented sandstone fragments; slightly effervescent; neutral; clear wavy boundary.

- A2—3 to 6 inches; light olive brown (2.5Y 5/4) loamy sand, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine roots; 5 percent weakly cemented sandstone fragments; slightly effervescent; neutral; gradual wavy boundary.
- C—6 to 16 inches; olive (5Y 5/3) loamy sand, olive (5Y 4/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine roots; 5 percent weakly cemented sandstone fragments; slightly effervescent; slightly alkaline; gradual wavy boundary.
- Cr1—16 to 35 inches; light olive gray (5Y 6/2) weakly consolidated sandy sedimentary beds, olive (5Y 4/3) moist; few very fine roots in cracks; slightly effervescent; slightly alkaline; gradual wavy boundary.
- Cr2—35 to 60 inches; light olive brown (2.5Y 5/4) weakly consolidated sandy sedimentary beds, olive brown (2.5Y 4/4) moist; slightly effervescent; slightly alkaline.

Range in Characteristics

Depth to 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

C horizon:

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2, 3, or 4
Texture: fine sand or loamy fine sand

Floweree Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Aridic Haplustolls

Typical pedon: 2,200 feet south and 100 feet east of the northwest corner of sec. 29, T. 12 N., R. 45 E.

- Ap1—0 to 4 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parts to moderate medium granular; soft, very friable, moderately sticky, moderately plastic; common fine and very fine roots; slightly alkaline; clear smooth boundary.
- Ap2—4 to 7 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parts to moderate fine subangular blocky; soft, very friable, moderately sticky, moderately plastic; common fine and very fine roots; slightly alkaline; clear wavy boundary.

- Bw—7 to 12 inches; brown (10YR 5/3) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parts to moderate fine subangular blocky; soft, very friable, moderately sticky, moderately plastic; common very fine roots; common fine and very fine pores; slightly alkaline; clear wavy boundary.
- Bk1—12 to 16 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; moderate medium prismatic structure parts to moderate medium subangular blocky; slightly hard, firm, moderately sticky, moderately plastic; common very fine roots; common fine and very fine pores; common fine and medium carbonate masses; strongly effervescent; moderately alkaline; gradual wavy boundary.
- Bk2—16 to 38 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; moderate medium prismatic structure; hard, very firm, moderately sticky, moderately plastic; common very fine roots; common fine and very fine pores; few fine carbonate masses; violently effervescent; moderately alkaline; clear wavy boundary.
- BC—38 to 60 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; massive; slightly hard, firm, moderately sticky, moderately plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches

Depth to carbonate accumulations: 11 to 25 inches

Note: A calcareous phase is recognized. It has approximately 5 percent calcium carbonate equivalent and an electrical conductivity of less than 4 mmhos/cm.

A horizons:

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Bw1 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

Bw2 horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: silt loam or silty clay loam

Bk1 horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: silt loam or silty clay loam

Bk2 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

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: loam, silt loam, or silty clay loam

Foreleft Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans and swales on plains

Parent material: Alluvium

Slope range: 2 to 8 percent

Elevation range: 2,600 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Haplustalfs

Typical pedon: 2,500 feet east and 500 feet north of the southwest corner of sec. 28, T. 2 N., R. 45 E.

- A—0 to 4 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine and very fine roots; common very fine tubular pores; slightly alkaline; clear smooth boundary.
- Bt1—4 to 7 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parts to strong medium angular blocky; hard, friable, slightly sticky, plastic; common fine and very fine roots; common very fine and few fine tubular pores; few faint clay films on faces of peds; slightly alkaline; clear smooth boundary.
- Bt2—7 to 16 inches; yellowish brown (10YR 5/4) clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure parts to strong coarse subangular blocky; hard, friable, slightly sticky, plastic; common fine and very fine roots; common very fine tubular pores; continuous distinct clay films on faces of peds and along pores; moderately alkaline; gradual smooth boundary.
- Btk—16 to 21 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parts to moderate coarse subangular blocky; hard, friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular pores; common distinct clay films on faces of peds and along pores; few fine carbonate masses; slightly effervescent; moderately alkaline; gradual wavy boundary.
- Bk1—21 to 51 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; moderate coarse prismatic structure; slightly hard, very friable, nonsticky, slightly plastic; common very fine roots; few very fine tubular pores; common medium carbonate masses; violently effervescent; moderately alkaline; diffuse wavy boundary.
- Bk2—51 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam, olive brown (2.5Y 4/4) moist; weak coarse prismatic structure; hard, friable, slightly sticky, plastic; few very fine tubular pores; common fine and medium carbonate masses; violently effervescent; strongly alkaline.

Range in Characteristics

Depth to carbonate accumulations: 11 to 22 inches

A horizon:

Hue: 2.5Y or 10YR
Value: 5, 6, or 7 dry; 3, 4, or 5 moist
Chroma: 2 or 3

Bt horizon:

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

Bk horizon:

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

Galbreth Series

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Landform: Knolls on plains

Parent material: Residuum weathered from sandstone

Slope range: 2 to 15 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Loamy, mixed, superactive, frigid, shallow Aridic Haplustepts

Typical pedon: 2,000 feet north and 300 feet east of the southwest corner of sec. 20, T. 8 N., R. 38 E.

Ap1—0 to 2 inches; brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; slightly alkaline; abrupt smooth boundary.

Ap2—2 to 7 inches; brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak medium platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular pores; slightly alkaline; abrupt smooth boundary.

Bw—7 to 13 inches; yellowish brown (10YR 5/4) sandy clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parts to moderate coarse angular blocky; hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular pores; slightly alkaline; clear smooth boundary.

Cr1—13 to 34 inches; light gray (5Y 7/1) fractured consolidated sandstone, gray (5Y 6/1) moist; common very fine roots at top of horizon; clear smooth boundary.

Cr2—34 to 60 inches; light gray (5Y 7/2) and yellow (10YR 7/6) weakly consolidated sandy sedimentary beds, light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/8) moist.

Range in Characteristics

Note: Some pedons have a Bk horizon.

A horizons:

Chroma: 2 or 3

Bw horizon:

Chroma: 2, 3, or 4

Texture: loam or sandy clay loam

Gerda Series

Depth to restrictive feature: Natric: 1 to 8 inches

Drainage class: Well drained

Landform: Alluvial fans and stream terraces on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Fine, smectitic, frigid Leptic Torric Natrustolls

Typical pedon: 590 feet north and 710 feet west of the southeast corner of sec. 29, T. 137 N., R. 100 W.

E—0 to 2 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and thick platy structure; hard, friable, slightly sticky, slightly plastic; many fine and very fine roots; common fine and very fine tubular pores; neutral; abrupt wavy boundary.

B_{tn}—2 to 11 inches; dark grayish brown (2.5Y 4/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; moderate coarse columnar structure parts to strong medium subangular blocky; extremely hard, extremely firm, moderately sticky, moderately plastic; common very fine roots between peds; common very fine tubular pores; many continuous prominent clay films on faces of peds and on surfaces along pores; moderately alkaline; clear wavy boundary.

B_{tkn}—11 to 19 inches; light olive brown (2.5Y 5/3) silty clay, olive brown (2.5Y 4/3) moist; moderate coarse prismatic structure parts to moderate medium subangular blocky; hard, firm, moderately sticky, moderately plastic; common very fine roots between peds; common very fine tubular pores; common discontinuous distinct clay films on all faces of peds; common fine irregular gypsum masses; common fine carbonate masses; violently effervescent; strongly alkaline; gradual wavy boundary.

B_{ky}—19 to 29 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky, slightly plastic; common very fine roots throughout; common very fine tubular pores; common fine carbonate masses; common fine irregular gypsum masses; violently effervescent; strongly alkaline; gradual wavy boundary.

B_k—29 to 44 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine tubular pores; common fine carbonate masses; violently effervescent; strongly alkaline; gradual wavy boundary.

C—44 to 80 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine tubular pores; strongly effervescent; strongly alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches after mixing

E horizon:

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2 or 3

Btn horizon:

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

Btkny horizon:

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

Bky 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 silty clay

C horizon:

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

Gerdrum Series

Depth to restrictive feature: Natric: 2 to 7 inches

Drainage class: Well drained

Landform: Alluvial fans, stream terraces, structural benches, and swales on plains

Parent material: Alluvium

Slope range: 0 to 15 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 135 days

Taxonomic class: Fine, smectitic, frigid Torrertic Natrustalfs

Typical pedon: 400 feet east and 300 feet north of the southwest corner of sec. 8, T. 8 N., R. 46 E.

E—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; common fine and very fine roots; common fine and very fine pores; slightly alkaline; abrupt smooth boundary.

Btn—3 to 9 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse columnar structure parts to moderate medium prismatic; hard, firm, moderately sticky, moderately plastic; common

very fine roots between peds; common fine and very fine pores; continuous distinct clay films on all faces of peds and on surfaces along pores; strongly alkaline; clear smooth boundary.

Btkn—9 to 16 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parts to strong fine and medium angular blocky; very hard, very firm, moderately sticky, moderately plastic; common very fine roots between peds; common fine and very fine pores; continuous distinct clay films on all faces of peds and on surfaces along pores; few carbonate masses; slightly effervescent; strongly alkaline; clear wavy boundary.

Bknyz—16 to 25 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure parts to strong medium subangular blocky and strong fine subangular blocky; hard, firm, very sticky, very plastic; common very fine roots; common fine and very fine pores; common irregular gypsum masses; common medium carbonate masses; strongly effervescent; strongly alkaline; clear wavy boundary.

Bz—25 to 60 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, firm, very sticky, very plastic; common very fine roots; common irregular gypsum masses; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to gypsum or other salts: 10 to 28 inches

Depth to carbonate accumulations: 10 to 24 inches, in some pedons it is as deep as 40 inches

E horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: loam, clay loam, or silty clay loam

Btn horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: silty clay loam, silty clay, or clay

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, silty clay loam, silty clay, or clay

Bknyz and Bz 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: sandy clay loam, clay loam, silty clay, or clay

Glendive Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained and moderately well drained

Landform: Drainageways on plains, flood plains in valleys

Parent material: Loamy alluvium

Slope range: 0 to 4 percent

Elevation range: 1,900 to 4,000 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Coarse-loamy, mixed, superactive, calcareous, frigid Aridic
Ustifluvents

Typical pedon: 650 feet west and 1,900 feet north of the southeast corner of sec. 6,
T. 16 N., R. 26 E.

- A—0 to 4 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak very fine subangular blocky structure parts to moderate fine granular; soft, very friable, slightly sticky, slightly plastic; few very fine roots; slightly effervescent; slightly alkaline; gradual smooth boundary.
- C1—4 to 7 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; few very fine roots; strongly effervescent; moderately alkaline; gradual smooth boundary.
- C2—7 to 45 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky, nonplastic; few very fine roots; strongly effervescent; moderately alkaline; gradual wavy boundary.
- C3—45 to 60 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

A horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: sandy loam, fine sandy loam, or loam

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: sandy loam, fine sandy loam, loam, or silt loam

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, fine sandy loam, loam, or silt loam

C3 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 thin layers of loamy sand, loamy fine sand, sandy loam, loam, silt loam, and clay loam

Hanly Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Somewhat excessively drained

Landform: Drainageways and flood plains on plains

Parent material: Sandy alluvium

Slope range: 0 to 2 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Sandy, mixed, frigid Aridic Ustifluvents

Typical pedon: 800 feet south and 1,100 feet west of the northeast corner of sec. 31, T. 10 N., R. 51 E.

A—0 to 8 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak medium granular structure parts to single grain; soft, very friable, nonsticky, nonplastic; few fine and very fine roots; neutral; clear wavy boundary.

C1—8 to 27 inches; light gray (10YR 7/2) stratified loamy sand, light brownish gray (10YR 6/2) moist; single grain; loose, loose, nonsticky, nonplastic; few fine and very fine roots; slightly effervescent; slightly alkaline; clear wavy boundary.

C2—27 to 60 inches; light brownish gray (10YR 6/2) sand, grayish brown (10YR 5/2) moist; single grain; loose, loose, nonsticky, nonplastic; slightly effervescent; slightly alkaline.

Range in Characteristics

A horizon:

Hue: 2.5Y or 10YR

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

Chroma: 2 or 3

Texture: loamy sand and loamy fine sand

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: loamy sand or loamy fine sand with stratified layers of very fine sandy loam, loam, or silt loam

Harlake Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Moderately well drained and well drained

Landform: Drainageways on plains and flood plains in valleys

Parent material: Clayey alluvium

Slope range: 0 to 3 percent

Elevation range: 1,900 to 4,000 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, calcareous, frigid Aridic Ustifluvents

Typical pedon: 650 feet west and 1,900 feet north of the southeast corner of sec. 6, T. 16 N., R. 26 E.

- A—0 to 3 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; weak thin platy structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; neutral; clear smooth boundary.
- C1—3 to 15 inches; pale brown (10YR 6/3) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; slightly effervescent; slightly alkaline; gradual wavy boundary.
- C2—15 to 28 inches; pale brown (10YR 6/3) stratified silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine roots; strongly effervescent; moderately alkaline; diffuse wavy boundary.
- C3—28 to 60 inches; pale brown (10YR 6/3) stratified silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, moderately sticky, moderately plastic; few very fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

A horizon:

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

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 loam, silty clay loam, silty clay, or clay consisting of stratified layers of silt loam, silty clay loam, silty clay, and clay

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 loam, silty clay loam, silty clay, or clay consisting of stratified layers of silt loam, silty clay loam, silty clay, and clay

C3 horizon:

Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: fine sandy loam, loam, silt loam, or clay loam consisting of stratified layers of fine sandy loam, silt loam, and silty clay loam

Havre Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained to somewhat poorly drained

Landform: Drainageways on badland sand plains, flood plains in valleys

Parent material: Loamy alluvium

Slope range: 0 to 2 percent

Elevation range: 1,900 to 4,000 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-loamy, mixed, superactive, calcareous, frigid Aridic Ustifluvents

Typical pedon: 2,200 feet north and 850 feet west of the southeast corner of sec. 11, T. 13 N., R. 48 E.

- A—0 to 10 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak coarse subangular blocky structure parts to moderate fine granular; soft, very friable, slightly sticky, nonplastic; common fine and many very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.
- C1—10 to 38 inches; pale brown (10YR 6/3) stratified loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common fine and very fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- C2—38 to 60 inches; pale brown (10YR 6/3) stratified loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; few fine and very fine roots; common very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

A horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: loam, silt loam, or silty clay loam

C1 horizon:

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: loam, silt loam, sandy clay loam, or clay loam which consists of strata of fine sandy loam, very fine sandy loam, silt loam, clay loam, and silty clay loam

C2 horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: loam, silt loam, sandy clay loam, or clay loam which consists of strata of fine sandy loam, very fine sandy loam, silt loam, clay loam, and silty clay loam

Hillon Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Fans, hills, and knolls on plains

Parent material: Till

Slope range: 2 to 45 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Fine-loamy, mixed, superactive, calcareous, frigid Aridic Ustorthents

Typical pedon: 40 feet west and 2,500 feet north of the southeast corner of sec. 17, T. 25 N., R. 44 E.

- A1—0 to 5 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate very fine and fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; slightly effervescent; slightly alkaline; clear wavy boundary.
- A2—5 to 7 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine roots; many fine tubular pores; many fine carbonate masses; 5 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.
- Bk1—7 to 27 inches; light gray (5Y 7/2) loam, olive (5Y 5/3) moist; massive; hard, friable, moderately sticky, slightly plastic; many fine roots; common fine tubular pores; many coarse carbonate masses; 5 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.
- Bk2—27 to 38 inches; light gray (5Y 7/2) loam, olive (5Y 5/3) moist; massive; hard, friable, slightly sticky, slightly plastic; common fine roots; common medium carbonate masses; 5 percent gravel; strongly effervescent; strongly alkaline; gradual wavy boundary.
- Bk3—38 to 60 inches; pale yellow (5Y 7/3) loam, olive (5Y 5/3) moist; massive; hard, friable, slightly sticky, slightly plastic; few fine roots; few fine and medium carbonate masses; 5 percent gravel; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to carbonate accumulations: 3 to 9 inches

A horizons:

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3, 4, or 5 moist
Chroma: 2 or 3

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

Ismay Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Moderately well drained

Landform: Drainageways on plains, flood plains in valleys

Parent material: Alluvium

Slope range: 0 to 2 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, calcareous, frigid Aridic Ustifluvents

Typical pedon: 900 feet north and 1,700 feet east of the southwest corner of sec. 28, T. 12 N., R. 55 E.

- A—0 to 8 inches; light yellowish brown (2.5Y 6/4) silty clay loam, olive brown (2.5Y 4/4) moist; moderate medium and fine granular structure; hard, firm, moderately sticky, moderately plastic; common fine and medium roots and many very fine roots; common very fine pores; few fine gypsum masses; few fine salt masses; strongly effervescent; moderately alkaline; clear smooth boundary.
- C1—8 to 17 inches; light yellowish brown (2.5Y 6/4) stratified silty clay loam, olive brown (2.5Y 4/4) moist; massive; hard, firm, moderately sticky, moderately plastic; common fine, very fine, and medium roots; common fine and very fine pores; few fine gypsum masses; few fine salt masses; strongly effervescent; moderately alkaline; clear smooth boundary.
- C2—17 to 25 inches; light yellowish brown (2.5Y 6/4) stratified silt loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common fine, very fine, and medium roots; few fine and many very fine pores; few fine gypsum masses; few fine salt masses; strongly effervescent; strongly alkaline; gradual smooth boundary.
- C3—25 to 50 inches; light yellowish brown (2.5Y 6/4) stratified loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common fine and very fine and few medium roots; few fine and common very fine pores; few fine salt masses; few fine gypsum masses; strongly effervescent; strongly alkaline; gradual smooth boundary.
- C4—50 to 60 inches; light yellowish brown (2.5Y 6/4) stratified loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; few very fine pores; few fine faint dark grayish brown (10YR 4/2) and common fine distinct yellowish brown (10YR 5/6) masses of oxidized iron; few fine gypsum masses; few fine salt masses; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to seasonal high water table: 42 to 60 inches for a short period during May or June

A horizon:

Hue: 2.5Y or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2, 3, or 4

C horizons:

Chroma: 2, 3, or 4
Texture: loam, silt loam, clay loam, or silty clay loam with thin strata of fine sandy loam, loam, silt loam, clay loam, or silty clay loam

Ivanell Series

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Knolls, stream terraces, and alluvial fans on plains

Parent material: Residuum weathered from shale

Slope range: 2 to 8 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Aridic Haplustalfs

Typical pedon: 1,500 feet east and 1,000 feet south of the northwest corner of sec. 32, T. 9 N., R. 38 E.

- E—0 to 3 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; slightly alkaline; abrupt smooth boundary.
- Bt—3 to 7 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parts to moderate fine and medium subangular blocky; hard, friable, moderately sticky, moderately plastic; many very fine roots; common very fine tubular pores; continuous faint clay films on faces of peds and along pores; slightly alkaline; clear smooth boundary.
- Btk—7 to 9 inches; light brownish gray (2.5Y 6/2) silty clay loam, light olive brown (2.5Y 5/4) moist; moderate medium prismatic structure parts to moderate medium subangular blocky; very hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular pores; common faint clay films on faces of peds; few fine carbonate masses; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bk—9 to 22 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure; very hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular pores; common fine carbonate masses; strongly effervescent; strongly alkaline; clear smooth boundary.
- BC—22 to 37 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine pores; slightly effervescent; strongly alkaline; gradual smooth boundary.
- Cr—37 to 60 inches; semiconsolidated shale; few very fine roots in cracks; common fine gypsum masses; moderately alkaline.

Range in Characteristics

Depth to carbonate accumulations: 6 to 12 inches

Depth to bedrock: 20 to 40 inches, mainly 25 to 40 inches

Note: A Bz horizon is allowed.

E horizon:

Hue: 2.5Y or 10YR

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

Texture: clay loam or silty clay loam

Bt horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay loam or silty clay loam

Btk horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay loam or silty clay loam

Bk horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay loam or silty clay loam

BC horizon:

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 4

Texture: silty clay loam or clay loam

Kirby Series*Depth to restrictive feature:* Greater than 60 inches*Drainage class:* Excessively drained to well drained*Landform:* Hills and knoll on plains*Parent material:* Residuum weathered from porcelanite*Slope range:* 4 to 45 percent*Elevation range:* 1,900 to 3,900 feet*Mean annual precipitation:* 10 to 14 inches*Mean annual air temperature:* 42 to 45 degrees F*Frost-free period:* 105 to 135 days*Taxonomic class:* Loamy-skeletal over fragmental, mixed, superactive, calcareous, frigid Aridic Ustorthents*Typical pedon:* 700 feet north and 700 feet east of the southwest corner of sec. 35, T. 7 S., R. 42 E.

A—0 to 4 inches; reddish brown (5YR 5/4) very channery loam, reddish brown (5YR 4/4) moist; weak fine granular structure; soft, very friable, slightly sticky, slightly plastic; many fine and very fine roots; 40 percent porcelanite channers; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk—4 to 12 inches; reddish brown (5YR 5/4) extremely channery loam, reddish brown (5YR 4/4) moist; weak fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine and very fine roots around fragments; common distinct carbonate coats on rock fragments; 5 percent flat porcelanite flagstones and 70 percent porcelanite channers; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C—12 to 60 inches; light red (2.5YR 6/6) channers, red (2.5YR 5/6) moist; few fine roots in cracks; common faint carbonate coats on bottom surfaces of rock fragments.

Range in Characteristics*Percent rock fragments:* 40 to 90 percent*Depth to fragmental material:* 11 to 20 inches

Note: The rock fragments in the Kirby soil are porcelanite but more locally called scoria which is defined as the product resulting from baking of shale and sandstone bedrock that was adjacent to burning coal beds.

A horizon:

Hue: 5YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3, 4, or 6

Bk horizon:

Hue: 2.5YR, 5YR, or 7.5YR

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

Chroma: 3, 4, or 6

Texture: sandy loam or loam

Rock fragments: 40 to 90 percent—5 to 20 percent flagstones and cobbles, 35 to 70 percent channers

2C horizon:

Hue: 10YR, 2.5YR, or 5YR,

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

Chroma: 1, 2, 3, 4, 5, or 6

Rock fragments: 90 to 95 percent—flagstones, stones, and channers

Kobase Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, hills, knolls, stream terraces, and swales

Parent material: Alluvium

Slope range: 0 to 25 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Torreritic Haplustepts

Typical pedon: 800 feet east and 1,350 feet north of the southwest corner of sec. 9, T. 18 N., R. 26 E.

Ap—0 to 7 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate very fine granular structure grading to weak fine and medium subangular blocky in the lower part; hard, very friable, moderately sticky, moderately plastic; many fine and very fine roots; many fine and very fine pores; slightly effervescent; neutral; abrupt wavy boundary.

Bw—7 to 15 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parts to moderate fine and medium angular blocky; very hard, friable, moderately sticky, moderately plastic; many fine and very fine roots; many fine and very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk1—15 to 20 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parts to weak medium and coarse subangular blocky; extremely hard, firm, moderately sticky, moderately plastic; common fine and very fine roots; many fine and very fine pores; few fine carbonate masses; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bk2—20 to 31 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse angular blocky structure; extremely hard, friable, moderately sticky, moderately plastic; common fine and very fine roots; many fine and very fine pores; few fine carbonate masses; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bky—31 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse angular blocky structure; hard, friable, moderately sticky, moderately plastic; few fine and very fine roots; many very fine pores; common fine threadlike salt masses; common fine threadlike gypsum masses; common fine carbonate masses; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to carbonate accumulations: 12 to 17 inches

Note: A C horizon is allowed.

A horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Bw horizon:

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, 3, or 4

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

Note: The one chromas are lithochromic from the parent material.

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: clay loam, silty clay loam, silty clay, or clay

Note: The one chromas are lithochromic from the parent material.

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: clay loam, silty clay loam, silty clay, or clay

Bky 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: clay loam, silty clay loam, silty clay, or clay

Notes: Some pedons have thin strata of loam or silt loam below depths of 40 inches and a BCy or Byz horizon. The one chromas are lithochromic from the parent material.

Kremlin Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, knolls, swales, and stream terraces on plains

Parent material: Loamy alluvium

Slope range: 0 to 15 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Haplustolls

Typical pedon: 1,900 feet east and 600 feet north of the southwest corner of sec. 31, T. 10 N., R. 57 E.

A1—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine granular structure; hard, very

friable, slightly sticky, slightly plastic; few fine and many very fine roots; neutral; clear smooth boundary.

A2—3 to 8 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few fine and many very fine roots; neutral; abrupt smooth boundary.

Bw—8 to 14 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate coarse prismatic structure parts to moderate medium subangular blocky; slightly hard, very friable, slightly sticky, slightly plastic; few fine and many very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—14 to 26 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate medium and fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; few fine carbonate masses; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—26 to 40 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; common fine carbonate masses; violently effervescent; moderately alkaline; gradual smooth boundary.

BC—40 to 60 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; violently effervescent; strongly alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches; in some pedons it includes all or only the upper part of the Bw1 horizon.

Depth to carbonate accumulations: 10 to 24 inches

A1 horizon:

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

A2 horizon:

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

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

Bw horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

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

Bk1 horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

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

Bk2 horizon:

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, sandy clay loam, or clay loam

Lallie Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Poorly drained

Landform: Depressions, flood plains

Parent material: Clayey alluvium

Slope range: 0 to 2 percent

Elevation range: 1,900 to 2,600 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Fine, smectitic, calcareous, frigid Vertic Fluvaquents

Typical pedon: 2,400 feet north and 1,200 feet east of the southwest corner of sec. 4, T. 7 N., R. 47 E.

A1—0 to 6 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; very hard, firm, moderately sticky, moderately plastic; common fine and very fine roots; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A2—6 to 9 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Cg1—9 to 37 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine pores; common coarse prominent light olive brown (2.5Y 5/6) and medium prominent light olive brown (2.5Y 5/6) iron-manganese masses; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg2—37 to 53 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine pores; common coarse and medium light olive brown (2.5Y 5/6) iron-manganese masses; slightly effervescent; slightly alkaline; gradual wavy boundary.

Cg3—53 to 60 inches; dark grayish brown (2.5Y 4/2) silty clay, light brownish gray (2.5Y 6/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; common very fine roots; common faint olive (5Y 4/3) and coarse distinct light olive brown (2.5Y 5/6) iron-manganese masses; slightly effervescent; slightly alkaline.

Range in Characteristics

10 to 40 inch particle-size control section: 35 and 60 percent clay

A horizons:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1 or 2

C horizons:

Hue: 2.5Y or 5Y

Value: 4, 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist

Chroma: 2 or less

Texture: silty clay loam, silty clay, or clay

Lonna Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, drainageways, hills, knolls, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 15 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Aridic Haplustepts

Typical pedon: 500 feet north and 1,400 feet east of the southwest corner of sec. 19, T. 12 N., R. 44 E.

A—0 to 5 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine and very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—5 to 10 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; moderate medium prismatic structure parts to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; common fine and very fine roots; many very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—10 to 17 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; moderate medium prismatic structure parts to moderate medium subangular blocky; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine pores; common fine carbonate masses; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—17 to 30 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine pores; common fine carbonate masses; violently effervescent; strongly alkaline; gradual smooth boundary.

BC—30 to 60 inches; pale yellow (2.5Y 7/4) silt loam, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; few very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonate accumulations: 10 to 16 inches

A 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

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

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

Bk2 horizon:

Hue: 10YR or 2.5Y
 Value: 5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist
 Chroma: 2, 3, or 4
 Texture: silt loam or silty clay loam

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

Lostriver Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Moderately well drained

Landform: Drainageways on plains, floodplains in valleys

Parent material: Clayey alluvium

Slope range: 0 to 2 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, calcareous, frigid Aridic Ustifluvents

Typical pedon: 900 feet east and 1,200 feet north of the southwest corner of sec. 11, T. 11 N., R. 26 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate thick platy structure parts to moderate medium and fine granular; hard, firm, moderately sticky, moderately plastic; common very fine and few fine, medium, and coarse roots; moderately alkaline; abrupt smooth boundary.

C—3 to 7 inches; grayish brown (2.5Y 5/2) stratified silty clay, clay loam, and silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; hard, firm, moderately sticky, moderately plastic; few fine, very fine, and medium roots; moderately alkaline; gradual smooth boundary.

Cyz—7 to 60 inches; light brownish gray (2.5Y 6/2) stratified silty clay loam, clay loam, and silty clay, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, very sticky, moderately plastic; few fine and very fine roots; many fine irregular gypsum masses; moderately alkaline.

Range in Characteristics

A horizon:

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2 or 3

C horizon:

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: clay loam, silty clay loam, silty clay, or clay that may have thin strata of loam, clay loam, or silty clay loam

Cyz horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: clay loam, silty clay loam, silty clay, or clay that may have thin strata of loam, clay loam, or silty clay loam

Marias Series*Depth to restrictive feature:* Greater than 60 inches*Drainage class:* Well drained*Landform:* Alluvial fans and stream terraces on plains*Parent material:* Clayey alluvium*Slope range:* 0 to 8 percent*Elevation range:* 2,240 to 3,620 feet*Mean annual precipitation:* 10 to 14 inches*Mean annual air temperature:* 42 to 45 degrees F*Frost-free period:* 105 to 135 days*Taxonomic class:* Fine, smectitic, frigid Aridic Haplusterts*Typical pedon:* 970 feet west and 700 feet north of the southeast corner of sec. 18, T. 26 N., R. 43 E.

A1—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure parts to strong fine and very fine granular; slightly hard, friable, moderately sticky, moderately plastic; many fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

A2—3 to 15 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, firm, very sticky, very plastic; common fine roots; slightly effervescent; moderately alkaline; clear wavy boundary.

Bss—15 to 33 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse and medium subangular blocky structure; hard, firm, very sticky, very plastic; many fine roots between peds; common distinct slickensides; few threadlike carbonate masses; slightly effervescent; moderately alkaline; clear wavy boundary.

Bssy—33 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse and medium subangular blocky structure; hard, firm, very sticky, very plastic; few fine roots; few distinct slickensides; common fine gypsum crystals; few carbonate masses; slightly effervescent; moderately alkaline.

Range in Characteristics*A horizons:*

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, or 3

Texture: silty clay or clay

Bss horizon:

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay or clay

Bssy horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, or 4

Texture: silty clay or clay

Marvan Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, depressions, stream terraces, and swales

Parent material: Clayey alluvium

Slope range: 0 to 8 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Sodic Haplusterts

Typical pedon: 2,150 feet north and 3,800 feet east of the southwest corner of sec. 19, T. 17 N., R. 27 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common fine and many very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bss—3 to 12 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common fine and many very fine roots; few slickensides; slightly effervescent; moderately alkaline; clear smooth boundary.

Bssy—12 to 35 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; common very fine roots; few slickensides; common fine gypsum masses; strongly effervescent; strongly alkaline; gradual smooth boundary.

Byz—35 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, very firm, moderately sticky, moderately plastic; common very fine roots; common fine threadlike salt masses; common fine threadlike gypsum masses; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to Bssy horizon: 10 to 24 inches

A horizon:

Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2, 3, or 4

Bss horizon:

Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2, 3, or 4
Texture: silty clay or clay

Bssy horizon:

Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2, 3, or 4
Texture: silty clay or clay

Byz horizon:

Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2, 3, or 4
Texture: silty clay or clay that includes thin strata of silt loam and silty clay loam

McKenzie Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Poorly drained

Landform: Depressions and drainageways on plains

Parent material: Clayey alluvium

Slope range: 0 to 2 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Chromic Endoaquerts

Typical pedon: 2,300 feet south and 200 feet east of the northwest corner of sec. 23, T. 1 S., R. 30 E.

- Ag—0 to 1 inches; gray (5Y 5/1) clay, olive gray (5Y 4/2) moist; strong fine granular structure; very hard, firm, very sticky, very plastic; common fine and very fine roots; slightly effervescent; clear smooth boundary.
- Bg1—1 to 7 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; strong fine granular structure; very hard, firm, very sticky, very plastic; common fine and very fine roots; slightly effervescent; gradual wavy boundary.
- Bg2—7 to 12 inches; gray (5Y 6/1) clay, dark gray (5Y 4/1) moist; moderate coarse and medium subangular blocky structure; extremely hard, very firm, very sticky, very plastic; few very fine roots; few very fine pores; strongly effervescent; gradual wavy boundary.
- Bg3—12 to 23 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; moderate coarse subangular blocky structure; extremely hard, very firm, very sticky, very plastic; common very fine pores; strongly effervescent; gradual wavy boundary.
- Cg—23 to 36 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 5/2) moist; massive; extremely hard, very firm, very sticky, very plastic; few very fine roots; few very

fine pores; few medium threadlike gypsum crystals; strongly effervescent; clear wavy boundary.

- C—36 to 60 inches; pale olive (5Y 6/3) clay, olive (5Y 5/3) moist; massive; very hard, very firm, very sticky, very plastic; few very fine pores; few medium threadlike gypsum masses.

Range in Characteristics

A horizon:

Hue: 5Y, 2.5Y, or 10YR
Value: 4 or 5 moist, 4, 5, or 6 dry
Chroma: 1 or 2

B horizons:

Hue: 2.5Y or 5Y
Value: 4 or 5 moist, 5 or 6 dry
Chroma: 1 or 2
Texture: silty clay or clay

C horizons:

Hue: 2.5Y or 5Y
Value: 4, 5, or 6 moist, 5, 6, or 7 dry
Chroma: 1, 2, or 3
Texture: silty clay or clay

Megonot Series

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Hills and knolls on plains

Parent material: Clayey residuum weathered from shale and siltstone

Slope range: 2 to 35 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Torreritic Haplustepts

Typical pedon: 700 feet west and 2,300 feet south of the northeast corner of sec. 21, T. 5 N., R. 46 E.

- A—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parts to moderate fine subangular blocky; hard; friable, moderately sticky, moderately plastic; many fine and very fine roots; common fine tubular and interstitial pores; neutral; clear smooth boundary.
- Bw—4 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky, very plastic; common fine and very fine roots; common fine and very fine tubular pores; slightly alkaline; clear wavy boundary.
- Bk—12 to 18 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; moderate medium prismatic structure parts to moderate fine and moderate medium subangular blocky; hard, firm, moderately sticky, very plastic; common fine and very fine roots; common very fine tubular pores; common fine carbonate masses; violently effervescent; moderately alkaline; clear wavy boundary.

By—18 to 28 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine subangular blocky structure; friable, hard, moderately sticky, very plastic; common fine and very fine roots; common fine irregular gypsum crystals; slightly effervescent; moderately alkaline; gradual wavy boundary.

Cr—28 to 60 inches; light gray (2.5Y 7/2) semiconsolidated shale, light brownish gray (2.5Y 6/2) moist.

Range in Characteristics

Depth to carbonate accumulations: 10 to 27 inches

Depth to bedrock: 20 to 40 inches

A horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Bw 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, silty clay, or clay

Bk horizon:

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

By 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, silty clay, or clay

Neldore Series

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Landform: Badlands, hills, and knolls

Parent material: Clayey residuum weathered from shale

Slope range: 0 to 70 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 43 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Clayey, smectitic, nonacid, frigid, shallow Aridic Ustorthents

Typical pedon: 2,000 feet west and 1,700 feet north of the southeast corner of sec. 17, T. 21 N., R. 24 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate very fine granular structure; hard, friable, very sticky, very plastic; common fine and very fine and few medium roots; slightly acid; clear wavy boundary.

- C1—3 to 12 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak medium and fine subangular blocky structure; very hard, friable, moderately sticky, very plastic; common very fine and fine and few medium roots; many very fine pores; 5 percent hard shale fragments; neutral; clear wavy boundary.
- C2—12 to 18 inches; gray (5Y 6/1) clay, gray (5Y 5/1) moist; massive; extremely hard, very firm, moderately sticky, very plastic; common very fine, fine, medium and coarse roots; few very fine pores; 5 percent hard shale fragments and 75 percent soft shale fragments; slightly acid; gradual wavy boundary.
- Cr—18 to 60 inches; gray (5Y 6/1) semiconsolidated shale, gray (5Y 5/1) and very dark gray (5Y 3/1) moist; slightly acid.

Range in Characteristics

Depth to 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
 Texture: silty clay loam, silty clay, or clay

C1 horizon:

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1 or 2; 4 to 6 for stains of shale
 Texture: silty clay or clay

C2 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 or clay

Niler Series

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Landform: Hills and knolls on plains

Parent material: Clayey residuum weathered from shale

Slope range: 2 to 35 percent

Elevation range: 2,600 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 135 days

Taxonomic class: Loamy, mixed, superactive, frigid, shallow Gypsic Haplustepts

Typical pedon: 100 feet north and 1,800 feet east of the southwest corner of sec. 17, T. 9 N., R. 39 E.

- A—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak thin platy structure parts to moderate fine granular; slightly hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

By—3 to 13 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, moderately sticky, moderately plastic; common very fine roots; few fine pores; common fine gypsum nests; 70 percent soft shale fragments; slightly effervescent; moderately alkaline; clear wavy boundary.

Cr—13 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated shale, grayish brown (2.5Y 5/2) moist; few very fine roots in cracks; moderately alkaline.

Range in Characteristics

Depth to By horizon: 2 to 4 inches

Depth to bedrock: 10 to 20 inches

A horizon:

Texture: clay loam or silty clay loam

By horizon:

Texture: clay loam or silty clay loam

Nobe Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Moderately well drained

Landform: Alluvial fans on plains

Parent material: Clayey alluvium

Slope range: 1 to 8 percent

Elevation range: 2,700 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 46 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Fine, smectitic, calcareous, frigid Torrtic Ustorthents

Typical pedon: 2,000 feet north and 250 feet east of the southwest corner of sec. 2, T. 13 N., R. 26 E.

E—0 to 1 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak thin platy structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine roots; neutral; abrupt smooth boundary.

Bw—1 to 4 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; moderate medium and fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; moderately alkaline; clear smooth boundary.

Byz—4 to 12 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; massive; hard, firm, moderately sticky, moderately plastic; few very fine roots; many fine salt masses; many fine gypsum masses; slightly effervescent; moderately alkaline; clear smooth boundary.

Bz—12 to 60 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; massive; hard, firm, moderately sticky, moderately plastic; many fine salt masses; slightly effervescent; moderately alkaline.

Range in Characteristics

Depth to Byz horizon: 4 to 16 inches

Depth to saturated zone: 24 to 42 inches for 1 to 4 months in the spring. The soil is moist below 42 inches when not saturated or frozen.

E horizon:

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 2 or 3

Bw horizon:

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

Byz horizon:

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

Bz horizon:

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Texture: silty clay loam, silty clay, or clay that is stratified with loam, silt loam, or clay loam

Rahworth Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans on plains

Parent material: Alluvium

Slope range: 2 to 8 percent

Elevation range: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Aridic Haplustepts

Typical pedon: 800 feet west and 300 feet south of the northeast corner of sec. 24, T. 9 N., R. 37 E.

E—0 to 2 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; moderately alkaline; abrupt smooth boundary.

Bw1—2 to 4 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parts to moderate very thin platy; hard, friable, moderately sticky, moderately plastic; many very fine roots; many very fine pores; moderately alkaline; abrupt smooth boundary.

Bw2—4 to 11 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parts to moderate medium angular blocky; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—11 to 23 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure; very hard, firm,

moderately sticky, moderately plastic; common very fine roots; common very fine pores; few fine carbonate masses; strongly effervescent; moderately alkaline; gradual smooth boundary.

Byz—23 to 36 inches; light yellowish brown (2.5Y 6/4) and grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) and light olive brown (2.5Y 5/4) moist; massive; very hard, firm, moderately sticky, moderately plastic; common very fine roots; common fine threadlike gypsum masses; few fine salt masses; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bz—36 to 43 inches; grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/6) silty clay loam, light olive brown (2.5Y 5/4) and dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; few very fine roots; few fine salt masses; moderately alkaline; gradual smooth boundary.

BC—43 to 60 inches; light yellowish brown (2.5Y 6/4) and grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) and light olive brown (2.5Y 5/4) moist; massive; very hard, friable, moderately sticky, moderately plastic; few very fine roots; few gypsum crystals; moderately alkaline.

Range in Characteristics

Depth to carbonate accumulations: 10 to 17 inches

Depth to Bz horizon: 16 to 28 inches

E horizon:

Texture: loam or clay loam

Clay content: 20 to 25 percent

Bw1 horizon:

Value: 5 or 6 dry

Bw2 horizon:

Texture: loam or clay loam

Bk horizon:

Value: 5 or 6 dry

Texture: silty clay loam or clay loam

Byz, Bz and BC horizons:

Hue: 10YR or 2.5Y

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

Chroma: 1, 2, or 4

Texture: clay loam or silty clay loam

Ralore Series

Depth to restrictive feature: Natric: 2 to 7 inches; Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Landform: Badlands, knolls on plains

Parent material: Clayey residuum weathered from shale

Slope range: 2 to 15 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 130 days

Taxonomic class: Clayey, smectitic, frigid, shallow Aridic Leptic Natrustalfs

Typical pedon: 600 feet east and 2,300 feet south of the northwest corner of sec. 29, T. 10 N., R. 42 E.

A—0 to 2 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium angular blocky structure parts to weak fine angular blocky; soft, very friable, slightly sticky, slightly plastic; many very fine roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Btn—2 to 7 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; strong fine prismatic structure parts to strong medium angular blocky; very hard, firm, moderately sticky, moderately plastic; many very fine roots; many very fine pores; many faint clay films on surfaces along pores and all faces of peds; slightly effervescent; very strongly alkaline; clear smooth boundary.

Btkn—7 to 12 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; many very fine roots; few very fine pores; common faint clay films on all faces of peds; common fine carbonate masses; strongly effervescent; very strongly alkaline; clear smooth boundary.

Byz—12 to 16 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable, moderately sticky, moderately plastic; common very fine roots; few fine salt masses; few fine gypsum masses; 10 percent shale fragments; slightly effervescency; strongly alkaline; clear smooth boundary.

Cr—16 to 60 inches; gray (10YR 6/1) semiconsolidated shale, gray (10YR 5/1) moist; roots matted on the top of horizon; slightly alkaline.

Range in Characteristics

Depth to carbonate accumulations: 6 to 10 inches

Depth to bedrock: 10 to 20 inches, mainly 12 to 18 inches

A horizon:

Hue: 10YR or 2.5Y

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

Chroma: 3 or 4

Btn horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: silty clay loam, clay loam, or clay

Btkn horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: silty clay loam, clay loam, or clay

Byz horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Ralph Series

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Knolls and structural benches on plains

Parent material: Residuum weathered from shale and siltstone

Slope range: 2 to 8 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Aridic Argiustolls

Typical pedon: 1,200 feet south and 65 feet east of the northwest corner of sec. 27, T. 9 N., R. 53 E.

A1—0 to 3 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, friable, slightly sticky, moderately plastic; many fine and very fine roots; slightly alkaline, pH 7.6; abrupt smooth boundary.

A2—3 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parts to strong fine angular blocky; slightly hard, friable, slightly sticky, moderately plastic; many very fine and fine roots; slightly alkaline; abrupt smooth boundary.

Bt—7 to 15 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parts to strong medium and fine angular blocky; slightly hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common fine and very fine pores; common discontinuous clay films on all faces of peds; slightly alkaline; clear smooth boundary.

Bk1—15 to 20 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; moderate coarse prismatic structure parts to moderate medium angular blocky; slightly hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common fine and very fine pores; common medium carbonate masses; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—20 to 28 inches; light yellowish brown (2.5Y 6/3) silty clay loam, light olive brown (2.5Y 5/3) moist; weak coarse prismatic structure parts to weak medium angular blocky; slightly hard, firm, moderately sticky, moderately plastic; common very fine roots; common fine and very fine pores; common medium irregular carbonate masses; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—28 to 60 inches; light gray (5Y 7/2) semiconsolidated shale, olive gray (5Y 5/2) moist.

Range in Characteristics

Mollic epipedon thickness: 7 to 11 inches after mixing

Depth to carbonate accumulations: 10 to 24 inches

Depth to bedrock: 20 to 40 inches

A horizons:

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Bt horizon:

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

Bk horizons:

Hue: 10YR or 2.5Y
 Value: 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, silt loam, clay loam, or silty clay loam

Rivra Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Drainageways on plains and flood plains in valleys

Parent material: Gravelly alluvium

Slope range: 0 to 2 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Sandy-skeletal, mixed, frigid Aridic Ustifluvents

Typical pedon: 2,100 feet west and 500 feet south of the northeast corner of sec. 31, T. 13 N., R. 51 E.

- A—0 to 9 inches; brown (10YR 5/3) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky, nonplastic; common fine and very fine roots; 35 percent gravel; slightly effervescent; slightly alkaline; clear wavy boundary.
- C—9 to 60 inches; pale brown (10YR 6/3) extremely gravelly coarse sand, brown (10YR 4/3) moist; single grain; loose, loose, nonsticky, nonplastic; few very fine roots; 15 percent cobbles and 60 percent gravel; slightly effervescent; moderately alkaline.

Range in Characteristics*A horizon:*

Hue: 10YR or 2.5Y
 Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 1, 2, or 3
 Texture: sandy loam or loam
 Rock fragments: 0 to 35 percent—0 to 10 percent stones and cobbles, 0 to 35 percent gravel

C horizon:

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: stratified sand, loamy coarse sand, loamy sand, or loamy fine sand
 Rock fragments: 55 to 80 percent—10 to 20 percent stones and cobbles, 45 to 70 percent gravel

Rominell Series

Depth to restrictive feature: Natric: 3 to 9 inches

Drainage class: Well drained

Landform: Alluvial fans, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Leptic Natrustalfs

Typical pedon: 1,650 feet east and 1,650 feet south of the northwest corner of sec. 19, T. 24 N., R. 48 E.

- A—0 to 4 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak medium and fine subangular blocky structure; soft, very friable, nonsticky, slightly plastic; many fine roots; common fine tubular pores; slightly alkaline; clear smooth boundary.
- E—4 to 9 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parts to weak medium subangular blocky; soft, very friable, nonsticky, nonplastic; many fine roots; many fine tubular pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.
- B_{tn}—9 to 15 inches; light brownish gray (2.5Y 6/2) clay loam, olive brown (2.5Y 4/3) moist; strong medium columnar structure parts to strong medium angular blocky; very hard, firm, moderately sticky, moderately plastic; many fine roots; many fine tubular pores; common faint clay films; many distinct light gray (2.5Y 7/2) skeletans on tops and sides of columns; strongly effervescent; very strongly alkaline; clear wavy boundary.
- B_{nyz}—15 to 25 inches; light olive brown (2.5Y 5/4) loam, dark brown (10YR 3/3) moist; moderate coarse prismatic structure parts to moderate medium subangular blocky; hard, friable, slightly sticky, slightly plastic; common fine roots; many fine tubular pores; few light gray (2.5Y 7/2) skeletans on vertical faces of peds; few fine gypsum crystals; violently effervescent; very strongly alkaline; gradual wavy boundary.
- B_{yz}—25 to 55 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; massive; hard, friable, moderately sticky, slightly plastic; common fine roots; common fine tubular pores; few fine gypsum crystals; violently effervescent; very strongly alkaline; gradual wavy boundary.
- C—55 to 60 inches; light olive brown (2.5Y 5/4) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, moderately sticky, slightly plastic; common fine tubular pores; violently effervescent; very strongly alkaline.

Range in Characteristics

A horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: fine sandy loam or loam

E horizon:

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 1 or 2

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

Btn horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: loam, clay loam, or sandy clay loam

Bnyz horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: sandy loam, loam, sandy clay loam, or clay loam

Byz horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: sandy loam, loam, sandy clay loam, or clay loam

C horizon:

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

Chroma: 2, 3, or 4

Texture: fine sandy loam, loam, sandy clay loam, clay loam, or silty clay loam

Ryell Series*Depth to restrictive feature:* Greater than 60 inches*Drainage class:* Well drained*Landform:* Drainageways on plains, flood plains in valleys*Parent material:* Alluvium*Slope range:* 0 to 2 percent*Elevation range:* 2,140 to 3,620 feet*Mean annual precipitation:* 10 to 14 inches*Mean annual air temperature:* 42 to 45 degrees F*Frost-free period:* 105 to 135 days*Taxonomic class:* Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, frigid Aridic Ustifluvents*Typical pedon:* 700 feet north and 1,350 feet east of the southwest corner of sec. 30, T. 13 N., R. 51 E.

A—0 to 9 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; many fine and common very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C1—9 to 25 inches; pale brown (10YR 6/3) stratified fine sandy loam to very fine sandy loam to loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky, nonplastic; common fine and very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

2C2—25 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, loose, nonsticky,

nonplastic; few fine and common very fine roots; 5 percent cobbles and 65 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to 2C2 horizon: 18 to 40 inches

A horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

C1 horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loamy very fine sand, very fine sandy loam, or loam with thin strata of fine sandy loam or silt loam

Rock fragments: 0 to 15 percent gravel

2C2 horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: sand or loamy sand

Rock fragments: 35 to 75 percent—0 to 15 percent cobbles, 35 to 60 percent gravel

Sonnett Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans and stream terrace on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 2,140 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Aridic Haplustalfs

Typical pedon: 2,000 feet west and 1,800 feet south of the northeast corner of sec. 24, T. 5 N., R. 51 E.

E—0 to 6 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parts to weak fine granular; soft, very friable, slightly sticky, slightly plastic; common fine and medium roots; common fine and very fine vesicular pores; neutral; clear smooth boundary.

Bt—6 to 14 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong fine and medium columnar structure parts to strong medium and coarse subangular blocky; very hard, very firm, moderately sticky, very plastic; common fine and medium roots between peds; few medium tubular pores and common very fine vesicular pores; few black (10YR 2/1) organic stains on vertical faces of peds; few distinct clay films on surfaces along pores and on all faces of peds; slightly alkaline; gradual wavy boundary.

- Btk**—14 to 20 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) moist; strong coarse prismatic structure parts to strong coarse subangular blocky; very hard, firm, moderately sticky, moderately plastic; common fine and very fine roots between peds; common fine tubular pores; very few faint clay films on surfaces along pores and on all faces of peds; very few faint black (10YR 2/1) organic stains on vertical faces of peds; common medium irregular carbonate masses; strongly effervescent; slightly alkaline; gradual wavy boundary.
- Bk**—20 to 25 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; hard, friable, slightly sticky, slightly plastic; common fine and very fine roots; common fine tubular pores; common medium carbonate masses; violently effervescent; slightly alkaline; gradual irregular boundary.
- Bky1**—25 to 31 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parts to moderate medium and coarse angular blocky; hard, firm, moderately sticky, moderately plastic; few fine and very fine roots; few fine tubular pores; very few faint black (10YR 2/1) organic stains on vertical faces of peds; few medium threadlike gypsum masses; common medium carbonate masses; violently effervescent; moderately alkaline; gradual wavy boundary.
- Bky2**—31 to 47 inches; light brownish gray (10YR 6/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure; slightly hard, friable, moderately sticky, moderately plastic; few fine roots; common very fine tubular pores; common medium threadlike gypsum masses; common medium carbonate masses; strongly effervescent; strongly alkaline; gradual smooth boundary.
- Bky3**—47 to 60 inches; light brownish gray (10YR 6/2) clay loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure; hard, friable, moderately sticky, moderately plastic; common fine tubular pores; common fine and medium threadlike gypsum masses; common fine carbonate masses; strongly effervescent; strongly alkaline.

Range in Characteristics

E horizon:

Value: 6 or 7 dry; 3 or 4 moist

Texture: loam (in some profiles it is a silty clay loam when mixed to 7 inches)

Bt horizon:

Hue: 10YR or 2.5Y

Value: 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: silty clay or clay

Btk horizon:

Hue: 10YR or 2.5Y

Value: 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: clay loam or silty clay loam

Bk horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 moist

Chroma: 2 or 3

Texture: loam or clay loam

Bky1 horizon:

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

Bky2 horizon:

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry; 3 or 4 moist
 Texture: loam or clay loam

Bky3 horizon:

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

Sumatra Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Knolls on plains

Parent material: Alluvium

Slope range: 2 to 8 percent

Elevation range: 2,700 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Fine-silty, mixed, superactive, nonacid, frigid Aridic Ustorthents

Typical pedon: 1,600 feet south and 2,000 feet east of the northwest corner of sec. 29, T. 9 N., R. 39 E.

A—0 to 2 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate fine granular structure; soft, firm, moderately sticky, moderately plastic; common fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

By—2 to 9 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; few fine roots; few fine pores; many fine gypsum masses; strongly effervescent; moderately alkaline; clear smooth boundary.

BC—9 to 29 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; few fine roots; few fine pores; moderately alkaline; gradual smooth boundary.

C—29 to 60 inches; light gray (2.5Y 7/2) and pale yellow (2.5Y 7/4) silty clay loam, light yellowish brown (2.5Y 6/4) and light brownish gray (2.5Y 6/2) moist; massive; very hard, firm, moderately sticky, moderately plastic; few fine roots; few fine pores; moderately alkaline.

Range in Characteristics

A horizon:

Value: 5 or 6 dry; 4 or 5 moist

By horizon:

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 4

Texture: clay loam or silty clay loam

C 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: clay loam or silty clay loam

Note: The C horizons remain moist in some part during the growing season.

Sunburst Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Hills and swales on plains

Parent material: Till

Slope range: 2 to 45 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Fine, smectitic, calcareous, frigid Torrtic Ustorthents

Typical pedon: 2,205 feet north and 235 feet west of the southeast corner of sec. 36, T. 26 N., R. 42 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure parts to moderate fine granular; soft, very friable, moderately sticky, moderately plastic; many fine roots; 5 percent gravel; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk1—3 to 19 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure; slightly hard, friable, moderately sticky, very plastic; many fine roots; many fine tubular pores; common medium and coarse carbonate masses; 5 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—19 to 50 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium angular blocky structure; hard, firm, moderately sticky, very plastic; few fine roots; common fine tubular pores; few carbonate masses; 5 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.

Bky—50 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium angular blocky structure; hard, firm, very sticky, very plastic; few fine roots; common fine tubular pores; few medium and coarse gypsum crystals; 5 percent gravel; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonate accumulations: 2 to 6 inches

A horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Bk horizons:

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: clay loam, silty clay loam, or clay

Bky horizon:

Hue: 2.5Y or 5Y

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

Chroma: 2 or 3

Texture: clay loam, silty clay, or clay

Telstad Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, knolls, and swales on plains

Parent material: Till

Slope range: 2 to 15 percent

Elevation range: 2,000 to 2,600 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Argiustolls

Typical pedon: 1,340 feet west and 1,810 feet north of the southeast corner of sec. 15, T. 25 N., R. 44 E.

A—0 to 4 inches; dark grayish brown (2.5Y 4/2) loam, very dark grayish brown (2.5Y 3/2) moist; moderate medium and fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; neutral; clear smooth boundary.

Bt1—4 to 7 inches; dark grayish brown (2.5Y 4/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; strong medium and fine prismatic structure parts to strong medium subangular blocky; hard, friable, moderately sticky, moderately plastic; many fine roots; many fine tubular pores; common dark brown (10YR 3/3) clay films on all faces of peds; neutral; clear wavy boundary.

Bt2—7 to 13 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium and coarse prismatic structure parts to moderate medium and coarse subangular; hard, friable, moderately sticky, moderately plastic; many fine roots; many fine tubular pores; common clay films on all faces of peds; neutral; clear wavy boundary.

Bk1—13 to 22 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure parts to moderate medium and coarse subangular blocky; slightly hard, friable, moderately sticky, slightly plastic; common fine roots; many fine tubular pores; many medium and coarse carbonate masses; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—22 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, moderately sticky, slightly plastic; few fine roots; few fine and medium carbonate masses; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches

Depth to carbonate accumulations: 10 to 20 inches

A horizon:

Hue: 10YR or 2.5Y
 Chroma: 2 or 3

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

Bk1 horizon:

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

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: loam or clay loam

Thoeny Taxadjunct

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Stream terraces, swales, and alluvial fans on plains

Parent material: Till

Slope range: 2 to 8 percent

Elevation range: 1,900 to 2,600 feet

Mean annual precipitation: 12 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 110 to 130 days

Taxonomic class: Fine, smectitic, frigid Torreritic Natrustalfs

Typical pedon: 1,400 feet north and 600 feet east of the southwest corner of sec. 12, T. 26 N., R. 49 E.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure parts to moderate very fine granular; slightly hard, very friable, moderately sticky, slightly plastic; many fine roots; 5 percent gravel; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Btkn1—6 to 12 inches; olive (5Y 5/3) clay loam, olive (5Y 4/3) moist; strong medium prismatic structure parts to strong medium subangular blocky; slightly hard, friable, moderately sticky, moderately plastic; many fine roots; many fine tubular pores; common clay films on all faces of peds; common carbonate masses on bottom of rock fragments; 5 percent gravel; violently effervescent; strongly alkaline; clear wavy boundary.

Btkn2—12 to 22 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong fine prismatic structure parts to strong very fine angular blocky; hard, firm, very sticky, moderately plastic; many fine roots; many fine tubular pores; many clay films on all faces of peds; many carbonate masses on bottom of rock fragments; 5 percent gravel; violently effervescent; strongly alkaline; clear wavy boundary.

Btkn3—22 to 31 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; moderate medium prismatic structure parts to moderate fine and medium subangular blocky; hard, firm, very sticky, moderately plastic; common fine roots; many fine tubular pores; common clay films on all faces of peds; many carbonate masses on bottom of rock fragments; 5 percent gravel; violently effervescent; very strongly alkaline; gradual wavy boundary.

By—31 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky, moderately plastic; few fine roots; common fine tubular pores; common fine and medium gypsum crystals; 5 percent gravel; strongly effervescent; strongly alkaline.

Range in Characteristics

Note: These soils are taxadjuncts to the Thoeny series because they have a “k” horizon within a depth of 10 inches and are very strongly alkaline in the Btkn2 horizon. These properties are outside the range of characteristics for the Thoeny series; they do not, however, significantly affect the use and behavior of these soils.

Ap horizon:

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Btkn horizons:

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

By horizon:

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Tinsley Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Excessively drained

Landform: Stream terraces on plains

Parent material: Gravelly alluvium

Slope range: 8 to 35 percent

Elevation range: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Sandy-skeletal, mixed, frigid Aridic Ustorthents

Typical pedon: 100 feet east and 300 feet north of the southwest corner of sec. 21, T. 6 N., R. 40 E.

A—0 to 4 inches; brown (10YR 5/3) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium platy structure; soft, very friable, nonsticky, nonplastic; many very fine roots; 40 percent gravel; neutral; clear smooth boundary.

C1—4 to 13 inches; brown (10YR 5/3) extremely gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose, loose, nonsticky, nonplastic; many very

fine roots; 5 percent cobbles and 60 percent gravel; neutral; clear smooth boundary.

C2—13 to 60 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; single grain; loose, loose, nonsticky, nonplastic; few very fine roots; 5 percent cobbles and 50 percent gravel; neutral.

Range in Characteristics

Note: A thin (4 inches or less) dark colored surface is allowed and does not meet the requirements for a mollic epipedon when mixed to 7 inches.

A horizon:

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2, 3, or 4

C horizons:

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

Rock fragments: 35 to 80 percent—5 to 25 percent stones and cobbles; 30 to 55 percent gravel

Twilight Series

Depth to restrictive feature: Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Alluvial fans, hills, and knolls on plains

Parent material: Residuum weathered from sandstone

Slope range: 2 to 45 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Coarse-loamy, mixed, superactive, frigid Haplocalcidic Haplustepts

Typical pedon: 2,400 feet north, 800 feet east of the southwest corner of sec. 34, T. 26 N., R. 44 E.

A—0 to 5 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky, nonplastic; many fine and very fine roots; neutral; clear wavy boundary.

Bw1—5 to 10 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure parts to moderate medium and fine subangular blocky; soft, very friable, nonsticky, nonplastic; many fine and very fine roots; neutral; clear wavy boundary.

Bw2—10 to 16 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; soft, very friable, nonsticky, nonplastic; many very fine roots; neutral; gradual wavy boundary.

Bk—16 to 24 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; structureless massive; soft, very friable, nonsticky, nonplastic; common very fine roots; common carbonate masses; slightly effervescent; neutral; gradual wavy boundary.

Cr—24 to 60 inches; light brownish gray (2.5Y 6/2) weakly consolidated sandstone, dark grayish brown (2.5Y 4/2) moist; few very fine roots in cracks.

Range in Characteristics

Depth to carbonate accumulations: 10 to 20 inches

Depth to bedrock: 20 to 40 inches

A horizon:

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: sandy loam or fine sandy loam

Bw horizons:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

Texture: sandy loam or fine sandy loam

Bk horizon:

Hue: 10YR or 2.5Y

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

Chroma: 1, 2, 3, or 4

Texture: sandy loam or fine sandy loam

Vaeda Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, stream terraces, and swales on plains

Parent material: Clayey alluvium

Slope range: 0 to 8 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 135 days

Taxonomic class: Fine, smectitic, nonacid, frigid Aridic Ustorthents

Typical pedon: 200 feet north and 200 feet east of the southwest corner of sec. 20, T. 26 N., R. 39 E.

E—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure; very hard, firm, very sticky, moderately plastic; common fine roots; many fine vesicular pores; light gray (2.5Y 7/2) sand coats on all faces of peds; moderately acid; clear smooth boundary.

By1—3 to 10 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium and thin platy structure parts to moderate fine subangular blocky; hard, firm, very sticky, moderately plastic; many fine roots; many fine tubular pores; light gray (2.5Y 7/2) sand coats on all faces of peds; common fine gypsum masses; strongly acid; clear smooth boundary.

By2—10 to 72 inches; gray (5Y 5/1) silty clay, dark gray (5Y 4/1) moist; weak medium angular blocky structure; very hard, firm, very sticky, moderately plastic; common fine roots; many fine tubular pores; few fine gypsum masses; neutral.

Range in Characteristics

E horizon:

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3

By1 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

By2 horizon:

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

Vanda Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, depressions, stream terraces, and swales on plains

Parent material: Clayey alluvium

Slope range: 0 to 8 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, calcareous, frigid Torrtic Ustorthents

Typical pedon: 1,400 feet north and 200 feet east of the southwest corner of sec. 5, T. 8 N., R. 48 E.

E—0 to 1 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; hard, firm, moderately sticky, moderately plastic; common fine and very fine roots; moderately alkaline; abrupt smooth boundary.

Bw—1 to 7 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse subangular blocky structure; very hard, very firm, very sticky, very plastic; common fine and very fine roots; common fine and very fine pores; slightly effervescent; moderately alkaline; clear wavy boundary.

Bz—7 to 20 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure; very hard, very firm, very sticky, very plastic; common fine and very fine roots; common fine and very fine pores; few fine salt masses; slightly effervescent; moderately alkaline; gradual smooth boundary.

Byz1—20 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine pores; common fine threadlike gypsum crystals; many medium salt masses; strongly effervescent; very strongly alkaline; gradual smooth boundary.

Byz2—30 to 60 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; massive; very hard, very firm, very sticky, very plastic; common fine threadlike gypsum crystals; many medium salt masses; slightly effervescent; very strongly alkaline.

Range in Characteristics

Depth to Byz horizon: 4 to 24 inches

E horizon:

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 1, 2, or 3
Texture: silty clay or clay

Bw horizon:

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 1, 2, or 3
Texture: silty clay or clay

Bz 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

Byz horizons:

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

Vanstel Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans and swales on plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Elevation range: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 115 to 130 days

Taxonomic class: Fine-silty, mixed, superactive, frigid Aridic Haplustalfs

Typical pedon: 1,300 feet north and 2,300 feet east of the southwest corner of sec. 5, T. 5 N., R. 40 E.

A—0 to 5 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak thin platy structure; soft, very friable, slightly sticky, slightly plastic; many fine roots; slightly alkaline; clear smooth boundary.

Bt1—5 to 11 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong medium prismatic structure parts to strong medium angular blocky; hard, friable, moderately sticky, moderately plastic; many fine roots; many very fine tubular pores; continuous distinct clay films on all faces of peds; slightly alkaline; clear smooth boundary.

- Bt2**—11 to 18 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parts to strong medium angular blocky; slightly hard, friable, slightly sticky, moderately plastic; common very fine roots; many fine tubular pores; continuous faint clay films on all faces of peds; slightly alkaline; gradual smooth boundary.
- Btk**—18 to 24 inches; light gray (10YR 7/2) loam, grayish brown (2.5Y 5/2) moist; moderate medium and coarse prismatic structure parts to moderate medium and coarse angular blocky; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; many very fine tubular pores; common faint clay films on all faces of peds; common fine carbonate masses; strongly effervescent; moderately alkaline; gradual smooth boundary.
- BC1**—24 to 35 inches; light gray (10YR 7/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few fine roots; strongly effervescent; moderately alkaline; gradual smooth boundary.
- BC2**—35 to 60 inches; very pale brown (10YR 7/3) loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to carbonate accumulations: 10 to 18 inches

A horizon:

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3

Bt horizons:

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

Btk horizon:

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

BC horizons:

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

Vendome Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Excessively drained

Landform: Stream terraces on plains

Parent material: Gravelly alluvium

Slope range: 4 to 35 percent

Elevation range: 1,900 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Sandy-skeletal, mixed, frigid Aridic Haplustolls

Typical pedon: 1,000 feet north and 1,000 feet east of the southwest corner of sec. 29, T. 2 N., R. 49 E.

- A1—0 to 3 inches; brown (10YR 4/3) gravelly sandy loam, dark brown (10YR 3/3) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many fine and medium roots; 25 percent gravel; slightly alkaline; clear smooth boundary.
- A2—3 to 9 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate coarse subangular blocky structure parts to weak fine granular; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; many fine and common medium roots; common fine carbonate masses; 20 percent gravel; strongly effervescent; slightly alkaline; clear wavy boundary.
- Bk—9 to 35 inches; light gray (10YR 7/2) very gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose, loose, nonsticky, nonplastic; common fine and very fine roots; common carbonate masses around rock fragments; 50 percent gravel; violently effervescent; moderately alkaline; gradual wavy boundary.
- C—35 to 60 inches; very pale brown (10YR 7/4) extremely gravelly loamy sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, loose, nonsticky, nonplastic; 70 percent gravel; violently effervescent; moderately alkaline.

Range in Characteristics

A horizons:

Chroma: 2 or 3

Bk horizon:

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

Chroma: 2, 3, or 4

Texture: loamy sand or sandy loam

C horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: sand or loamy sand

Rock fragments: 35 to 75 percent—0 to 15 percent cobbles and stones; 35 to 60 percent gravel

Volborg Series

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Landform: Hills on plains

Parent material: Residuum weathered from shale

Slope range: 4 to 60 percent

Elevation range: 2,240 to 3,620 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Clayey, smectitic, acid, frigid, shallow Aridic Ustorthents

Typical pedon: 600 feet east and 500 feet south of the northwest corner of sec. 30, T. 16 N., R. 28 E.

- A—0 to 3 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate fine and very fine granular structure; soft, very friable, moderately sticky, moderately plastic; common very fine roots; moderately acid; clear smooth boundary.
- C1—3 to 8 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, friable, very sticky, very plastic; common fine and very fine roots; 30 percent soft shale fragments; very strongly acid; clear smooth boundary.
- C2—8 to 14 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; massive; slightly hard, friable, very sticky, very plastic; common fine and very fine roots; 75 percent soft shale fragments; very strongly acid; clear smooth boundary.
- Cr—14 to 60 inches; gray (10YR 5/1) semiconsolidated shale.

Range in Characteristics

A horizon:

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1, 2, or 3

C horizons:

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1, 2, or 3
Texture: silty clay loam, silty clay, or clay

Weingart Series

Depth to restrictive feature: Natric: 1 to 7 inches; Bedrock (paralithic): 20 to 40 inches

Drainage class: Well drained

Landform: Hills, knolls, structural benches on plains

Parent material: Residuum weathered from clayey shale

Slope range: 0 to 15 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine, smectitic, frigid Torreritic Natrustalfs

Typical pedon: 165 feet east and 920 feet north of the southwest corner of sec. 33, T. 19 N., R. 22 E.

- E—0 to 2 inches; light gray (2.5Y 7/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate very thin platy structure; slightly hard, very friable, moderately sticky, moderately plastic; common medium, fine, and very fine roots; common fine and very fine vesicular pores; moderately acid; abrupt wavy boundary.
- Btn1—2 to 7 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium columnar structure parts to strong fine and very fine angular blocky; extremely hard, firm, moderately sticky, very plastic; common medium, fine, and very fine roots; common fine and very fine pores; continuous faint clay films on all faces of ped; slightly alkaline; clear irregular boundary.

- Btn2—7 to 13 inches; light yellowish brown (2.5Y 6/4) clay, olive brown (2.5Y 4/4) moist; strong medium and fine angular blocky structure; very hard, firm, moderately sticky, very plastic; common medium, fine, and very fine roots; common fine and very fine pores; continuous faint clay films on all faces of peds; moderately alkaline; clear irregular boundary.
- Bkn—13 to 21 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, moderately sticky, very plastic; common medium, fine, and very fine roots; common fine and very fine pores; common fine and medium carbonate masses; strongly effervescent; moderately alkaline; clear wavy boundary.
- Bknyz—21 to 29 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; few fine distinct olive brown (2.5Y 4/4) mottles; weak fine and medium subangular blocky structure; firm, very hard, moderately sticky, very plastic; few medium, fine, and few very fine roots; common fine and very fine pores; many medium gypsum masses; common carbonate masses around rock fragments; slightly effervescent; moderately alkaline; clear irregular boundary.
- Bnyz—29 to 35 inches; light olive gray (5Y 6/2) channery clay, dark gray (5Y 4/1) moist; many fine distinct light yellowish brown (10YR 6/4) mottles; massive; extremely hard, firm, moderately sticky, very plastic; few fine and very fine roots; common fine and very fine pores; common fine and medium gypsum masses; slightly alkaline; gradual wavy boundary.
- Cr—35 to 60 inches; semiconsolidated shale, few fine and medium gypsum masses in cracks.

Range in Characteristics

Depth to gypsum or other salts: 10 to 24 inches

Depth to carbonate accumulations: 7 to 16 inches

Depth to bedrock: 20 to 40 inches

E horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: loam, clay loam, or clay

Btn horizons:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

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

Bkn horizon:

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

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

Bknyz horizon:

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, 3, or 4

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

Bnyz horizon:

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1, 2, 3, or 4

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

Yamacall Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Well drained

Landform: Alluvial fans, hills, knolls, stream terraces, and swales on plains

Parent material: Alluvium

Slope range: 0 to 35 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Fine-loamy, mixed, superactive, frigid Aridic Haplustepts

Typical pedon: 70 feet east and 80 feet north of the southwest corner of sec. 28,
T. 26 N., R. 43 E.

- A—0 to 4 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine roots; slightly alkaline; clear wavy boundary.
- Bw—4 to 11 inches; olive (5Y 5/3) loam, olive (5Y 4/3) moist; moderate medium prismatic structure parts to moderate medium and fine angular blocky; slightly hard, friable, slightly sticky, moderately plastic; many fine roots; many fine tubular pores; slightly effervescent; slightly alkaline; gradual wavy boundary.
- Bk1—11 to 19 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse and medium prismatic structure; slightly hard, friable, slightly sticky, moderately plastic; many fine roots; many fine tubular pores; common carbonate masses; violently effervescent; moderately alkaline; gradual wavy boundary.
- Bk2—19 to 34 inches; pale olive (5Y 6/3) loam, olive (5Y 4/3) moist; weak coarse prismatic structure; hard, friable, slightly sticky, slightly plastic; common fine roots; many fine tubular pores; few distinct carbonate coats on all faces of peds; common carbonate masses; violently effervescent; moderately alkaline; gradual wavy boundary.
- Bk3—34 to 48 inches; pale olive (5Y 6/4) loam, olive (5Y 4/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common fine roots; many fine tubular pores; common carbonate masses; violently effervescent; strongly alkaline; gradual wavy boundary.
- C—48 to 60 inches; pale olive (5Y 6/4) loam, olive (5Y 4/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; few fine roots; common fine tubular pores; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to carbonate accumulations: 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

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, silt loam, or clay loam

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, silt loam, or clay loam

Yawdim Series

Depth to restrictive feature: Bedrock (paralithic): 10 to 20 inches

Drainage class: Well drained

Landform: Hills and knolls on plains

Parent material: Residuum weathered from shale and siltstone

Slope range: 2 to 70 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Clayey, smectitic, calcareous, frigid, shallow Aridic Ustorthents

Typical pedon: 1,900 feet north and 300 feet east of the southwest corner of sec. 15, T. 9 N., R. 53 E.

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

C1—5 to 9 inches; light gray (5Y 7/2) silty clay, light olive gray (5Y 6/2) moist; weak coarse prismatic structure; hard, firm, moderately sticky, very plastic; common fine and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—9 to 18 inches; light gray (5Y 7/1) silty clay, light olive gray (5Y 6/2) moist; weak coarse prismatic structure; hard, firm, moderately sticky, very plastic; common fine and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—18 to 60 inches; light gray (5Y 7/2) semiconsolidated shale, light olive gray (5Y 6/2) moist.

Range in Characteristics

Depth to bedrock: 10 to 20 inches

A horizon:

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 1 or 2

Texture: silty clay or silty clay loam

C horizons:

Hue: 10YR, 2.5Y, or 5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 1 to 4

Yetull Series

Depth to restrictive feature: Greater than 60 inches

Drainage class: Somewhat excessively drained

Landform: Alluvial fans, dunes, hills, and knolls on plains, dunes in valleys

Parent material: Sandy eolian deposits

Slope range: 2 to 25 percent

Elevation range: 1,900 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Mean annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 135 days

Taxonomic class: Mixed, frigid Aridic Ustipsamments

Typical pedon: 1,400 feet south and 2,800 feet west of the northeast corner of sec. 20, T. 3 N., R. 47 E.

- A—0 to 6 inches; light olive brown (2.5Y 5/4) loamy fine sand, olive brown (2.5Y 4/4) moist; weak medium and fine granular structure; loose, loose, nonsticky, nonplastic; common fine and very fine roots; neutral; clear smooth boundary.
- C1—6 to 17 inches; light olive brown (2.5Y 5/4) loamy fine sand, olive brown (2.5Y 4/4) moist; single grain; loose, loose, nonsticky, nonplastic; common fine and very fine roots; common fine and very fine pores; slightly effervescent; moderately alkaline; clear wavy boundary.
- C2—17 to 40 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; single grain; loose, loose, nonsticky, nonplastic; common fine and very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.
- C3—40 to 60 inches; light olive brown (2.5Y 5/4) loamy fine sand, olive brown (2.5Y 4/4) moist; massive; loose, loose, nonsticky, nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

A horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loamy fine sand or fine sandy loam

C1 horizon:

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: sand, fine sand, loamy sand, or loamy fine sand

C2 horizon:

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, or loamy fine sand

C3 horizon:

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, or loamy fine sand

Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Cropland Limitations and Hazards

The management concerns affecting the use of the detailed map units in the survey area for crops are shown in the table "Potential Cropland Limitations and Hazards". The main concerns in managing nonirrigated cropland are conserving moisture, controlling soil blowing and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water intake rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *soil blowing* and *water erosion*. Conservation tillage, stripcropping, field windbreaks, tall grass barriers, contour farming, conservation cropping systems, crop residue management, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the limitations and hazards shown in the table cannot be easily overcome. These are *channels*, *flooding*, *gullies*, and *lack of timely precipitation*.

Additional limitations and hazards are as follows:

Areas of rock outcrop and slickspots.—Farming around these areas may be feasible. Subsoiling or deep ripping soft sedimentary beds increases the effective rooting depth and the rate of water infiltration.

Lime content, limited available water capacity, poor tilth, restricted permeability, and surface crusting.—These limitations can be overcome by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Short frost-free season.—If the growing season is less than 90 days, short-season crops or grasses should be grown.

Surface coarse fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Slope.—Where the slope is more than 8 percent, water erosion and soil blowing may be accelerated unless conservation farming practices are applied.

Surface stones.—Stones or boulders on the surface can hinder normal tillage unless they are removed.

Salt and sodium content.—In areas where this is a limitation, only salt- and sodium-tolerant crops should be grown.

On irrigated soils the main management concerns are *efficient water use, nutrient management, control of erosion, pest and weed control, and timely planting and harvesting* for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Also, it can create drainage problems, raise the water table, and increase soil salinity.

Following is an explanation of the criteria used to determine the limitations or hazards:

Areas of rock outcrop.—Rock outcrop is a named map unit component.

Areas of slickspots.—Slickspots is a named map unit component.

Channeled.—Channeled is included in the map unit name.

Depth to rock.—Bedrock depth range is less than 40 inches.

Erosion by water.—The surface K factor multiplied times the upper slope limit is greater than 2 (same as prime farmland criteria).

Excessive permeability.—The upper limit of the permeability range is 6 inches or greater within the soil profile.

Flooding.—The map unit component has a flooding hazard of occasional or frequent.

Gullied.—Gullied is included in the map unit name.

Lack of timely precipitation.—The map unit component is classified as being in the Xeric moisture regime and the precipitation ranges no higher than 14 inches.

Lime content.—The component is assigned to wind erodibility group 4L or has greater than 5 percent lime in the upper 10 inches of the soil profile.

Limited available water capacity.—The soil available water capacity calculated to 60 inches or root limiting layer is 5 inches or less.

Ponding.—The map unit component has a ponding duration assigned.

Poor tilth.—The map unit component has greater than 35 percent clay in the surface layer.

Restrictive permeability.—The map unit component has a permeability of 0.06 inches per hour or less, within the soil profile.

Salt content.—The map unit component has an electrical conductivity of greater than 4 within the soil surface layer, or greater than 8 within 30 inches of the surface.

Short frost-free season.—The map unit has a growing season that ranges less than 90 frost-free days.

Slope.—The map unit component upper slope range is greater than 8 percent.

Sodium content.—The map unit component sodium adsorption ratio is greater than 13 within 30 inches of the soil surface.

Soil blowing.—The map unit component wind erodibility index multiplied by the selected high C factor for the survey area, divided by the T factor is greater than 8.

Surface coarse fragments.—Any component surface texture coarse fragment modifier except gravelly or channery, and surface stones limitation is not already listed.

Surface crusting.—Sodium adsorption ratio levels in the soil surface are 5 or greater, or the surface texture is silt, silt loam, loam, or very fine sandy loam, and surface sodium adsorption ratio is 4 or greater.

Surface stones.—The map unit component has any stony or bouldery surface texture modifier.

Water table.—The map unit component has a water table identified within 60 inches of the soil surface (keyed from water table kind).

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, (USDA, 1961), soils generally are grouped at three levels: capability class, subclass, and unit. These categories indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes I, II, III, and IV are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class I to class IV. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes V, VI, and VII are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class V to class VII.

Areas in class VIII are generally not suitable for crops, pasture, or woodland without a level of management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses identify the dominant kind of limitation in the class. They are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, IIe. The letter e shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class I because the soils of this class have few limitations. Class V contains only the subclasses indicated by w, s, or c because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the table "Land Capability and Yields per Acre of Crops".

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops under a high level of management are shown in the table "Land Capability and Yields per Acre of Crops". In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss. Yields for dryland crops are based on an alternate crop-fallow system.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the table are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Pasture and Hayland Interpretations

Soils are assigned to pasture and hayland groups according to their suitability for the production of forage. The soils in each group are similar enough to be suited to the same species of grasses or legumes, have similar limitations and hazards, require similar management, and have similar productivity levels and other responses to management.

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often provided in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about forage yields.

Prime Farmland and Other Important Farmland

In this section, prime farmland and other important farmland are defined. The soils in the survey area that are considered prime farmland are listed in the table "Prime and Important Farmland".

Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, seed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slopes range mainly from 0 to 6 percent.

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland where these limitations are overcome by drainage measures, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

The map units in the survey area that meet the requirements for prime farmland are listed in the table "Prime and Important Farmland". On some soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps. The soil qualities that affect use and management are described in the section "Detailed Map Units". This list does not constitute a recommendation for a particular land use.

Unique Farmland

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil qualities, location, growing season, and moisture supply needed for the economic production of sustained high yields of a specific high-quality crop when treated and managed by acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, and vegetables.

Unique farmland is used for a specific high-value food or fiber crop; has an adequate supply of available moisture for the specific crop because of stored moisture, precipitation, or irrigation; and has a combination of soil qualities, growing season, temperature, humidity, air drainage, elevation, aspect, and other factors, such as nearness to markets, that favors the production of a specific food or fiber crop.

Lists of unique farmland are developed as needed in cooperation with conservation districts and others.

Farmland of Statewide Importance

Some areas other than areas of prime and unique farmland are of statewide importance in the production of food, feed, fiber, forage, and oilseed crops. The criteria used in defining and delineating these areas are determined by the appropriate State agency or agencies. Generally, additional farmland of statewide importance includes areas that nearly meet the criteria for prime farmland and that economically produce high yields of crops when treated and managed by acceptable farming methods. Some areas can produce as high a yield as areas of prime farmland if conditions are favorable. In some states additional farmland of statewide importance may include tracts of land that have been designated for agriculture by State law.

The map units in the survey area that meet the requirements for farmland of statewide importance are listed in the table "Prime and Important Farmland".

Additional Farmland of Local Importance

This land consists of areas that are of local importance in the production of food, feed, fiber, forage, and oilseed crops and are not identified as having national or statewide importance. Where appropriate, this land is identified by local agencies. It may include tracts of land that have been designated for agriculture by local ordinance.

Lists of this land are developed as needed in cooperation with conservation districts and others.

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices.

Soil Erodibility (K) Factor

The soil erodibility factor (K) indicates the susceptibility of a soil to sheet and rill erosion by water. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (Kf) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance factor (T) is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullyng, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index factor (I) is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter.

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, yards, fruit trees, gardens, and cropland from wind and snow; help to keep snow on fields; and provide food and cover for wildlife. Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

The "Windbreaks and Environmental Plantings" table shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Cooperative Extension Service or from a commercial nursery.

Conservation Tree/Shrub Groups

The table "Conservation Tree/Shrub Groups" lists the group for each map unit component. The groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in

windbreaks are about the same. The following paragraphs describe the conservation tree shrub groups.

Group 1 consists of deep, well drained to somewhat poorly drained soils that receive beneficial moisture from favorable landscape positions, flooding, runoff from adjacent land, or have a beneficial seasonally high water table during the spring.

Group 1SK consists of deep, well drained to somewhat poorly drained calcareous soils that receive beneficial moisture from favorable landscape positions, flooding, runoff from adjacent land, or have a beneficial seasonally high water table during the spring. Free carbonates are within 12 inches of the surface.

Group 3 consists of soils that are well drained, loamy or silty throughout, and have a high available water capacity. Permeability is moderate or moderately slow. These soils do not have free carbonates in the upper 12 inches.

Group 4C consists of moderately deep and deep soils that are well drained and have a loamy surface layer and clayey subsoil. These soils have a low to moderate available water capacity. Permeability is slow.

Group 4CK consists of moderately deep and deep calcareous soils that are well drained and have a loamy surface layer and clayey subsoil. These soils have a low to moderate available water capacity. Permeability is slow. Free carbonates are within 12 inches of the surface.

Group 5 consists of soils that are deep, with loamy and sandy textures. This group typically includes soils that have low to moderate available water capacity.

Group 5K consists of soils that are deep, with loamy and sandy textures. This group typically includes soils that normally have low to moderate available water capacity. Free carbonates are within 12 inches of the surface.

Group 6 consists of well drained, mostly loamy soils that are moderately deep over sand, gravel, bedrock, and other layers than can severely restrict root growth. They have low or moderate available water capacity.

Group 6K consists of well drained, calcareous, mostly loamy soils, that have sand, gravel, bedrock or other root restrictive layers at a depth of 20 to 60 inches. These soils have very low available water holding capacity. Free carbonates are within 12 inches of the surface.

Group 6G consists of well drained soils that are loamy in the upper part and have sand or sand and gravel at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 6GK consists of well drained calcareous soils that are loamy in the upper part and have sand or sand and gravel at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity. Free carbonates are within 12 inches of the surface.

Group 6D consists of excessively drained to moderately well drained, loamy soils that have bedrock or other root restricting layer at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 7 consists of deep, excessively to moderately well drained sandy soils. These soils typically have low to very low available water capacity, and do not normally have adequate moisture.

Group 8 consists of soils that are calcareous at or near the surface. They do not receive beneficial moisture from run-in, flooding, or seasonal high water tables.

Group 9L consists of soils that are slightly to moderately saline within 12 inches of the surface. These soils do not have a seasonal high water table.

Group 9N consists of soils that are affected by sodicity. These soils do not have a seasonal high water table.

Group 10 consists of soils or miscellaneous areas that generally are not suitable for windbreaks. One or more characteristics, such as soil depth, texture, wetness, available water capacity, or slope, limit the planting, survival, or growth of trees and shrubs.

Rangeland

Range makes up about 83 percent of the land in Garfield County. Most grazing is on native range. The range is used primarily for grazing by domestic livestock; however, it also is used as wildlife habitat, recreational areas, and watersheds and has aesthetic value.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on range are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Range is defined as land on which the native vegetation (the climax, or natural potential, plant community) is predominantly grasses, grasslike plants, forbs, and shrubs suitable for grazing and browsing. Range includes natural grasslands, savannas, many wetlands, and certain shrub and forb communities. Range receives no regular or frequent cultural treatment. The composition and production of the plant community are determined by soil, climate, topography, overstory canopy, and grazing management.

Grazed forestland is defined as land on which the understory includes, as an integral part of the forest plant community, plants that can be grazed without significant impairment of other forest values.

Native pasture is defined as land on which the potential (climax) vegetation is forest but which is used and managed primarily for the production of native forage plants. Native pasture includes cutover forestland and forestland that has been cleared and is managed for native or naturalized forage plants.

The table "Rangeland and Grazeable Understory – Productivity and Characteristic Plant Communities" shows, for each listed soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in this table follows.

Range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants.

Many different range sites are in the survey area. Over time, the combination of plants best suited to a particular soil and climate has become established. If the soil is not excessively disturbed, this group of plants is the natural plant community for the site. Natural plant communities are not static but vary slightly from year to year and place to place.

The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important. Specific information about range sites in Garfield County can be found in the electronic Field Office Technical Guide at <http://www.usda.gov/technical/efotg/>.

Total production is the amount of vegetation that can be expected to grow annually on well managed range that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation consists of the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil. The plants are listed by common name.

Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range Condition

Range condition is based on a comparison of the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the natural community, the better the range condition.

Abnormal disturbances that change the natural plant community include repeated overuse by livestock, excessive burning, erosion, and plowing. Grazing animals select the most palatable plants. These plants will eventually die if they are continually grazed. A very severe disturbance can completely destroy the natural community. Under these conditions, the less desirable plants, such as annuals and weedlike plants, can invade. If the plant community has not deteriorated significantly, it eventually can return to dominantly natural plants if proper grazing management is applied.

Four range condition classes are used to show the degree of deterioration of the natural plant community.

An area of rangeland is in *excellent* condition if more than 75 percent of the present plant community is the same as the natural plant community. It is in *good* condition if the natural plants make up 51 to 75 percent of the present plant community, in *fair* condition if those plants make up 26 to 50 percent, and in *poor* condition if they make up less than 25 percent.

Knowledge of the range site and condition is necessary as a basis for planning and applying the management needed to maintain or improve the desired plant community for selected uses. Such information is needed to determine management objectives, proper grazing systems and stocking rates, suitable wildlife management practices, the potential for recreational uses, and the condition of watersheds.

Rangeland Management

Rangeland management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of less desirable species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Grazing management is the most important part of any rangeland management program. Proper grazing use, timely deferment of grazing, and planned rotation grazing systems are key practices. The experiences of ranchers and research have shown that if no more than one-half of the current year's growth is grazed, a plant community in good or excellent condition can be maintained and one in fair condition can be improved. The remaining one-half enables plants to make and store food for regrowth and root development. As a result, the desirable plants remain healthy and are not replaced by less desirable grasses and weeds. Also, the plant cover protects the soil from water erosion and soil blowing, improves tilth, increases the rate of water infiltration, and helps to control runoff.

Certain practices commonly are needed to obtain a uniform distribution of grazing. These include developing livestock watering facilities, fencing, properly locating salt and mineral supplements, constructing livestock trails in steeply sloping areas, and riding or herding.

Various kinds of grazing systems can be used in range management. No single grazing system is best under all conditions. The grazing system should increase the quantity and improve the quality of the range vegetation, should meet the needs of the individual operator, and should be designed according to the topography, the type of grazing animals, and the resource management objectives.

Special improvement practices are needed in areas where management practices do not achieve the desired results or where recovery is too slow under forage management alone. These include range seeding, brush management, water spreading, prescribed burning, and mechanical treatment.

Some soils are suited to mechanical treatment for range improvement. On other soils, however, only proper grazing management can improve the range. Many soils in capability classes 1 through 4 are suited to such practices as seeding, mechanical brush and weed control, and water spreading. Those in capability classes 7 and 8, however, are not suitable. Many soils in capability classes 1 through 4 are suited to tillage for seedbed preparation before native or introduced forage plant species are seeded. Soils in capability class 6 may be suited to limited surface disturbance, such as scarification, for the purpose of seeding and as a means of increasing the rate of water infiltration for seed germination.

Where feasible, mechanical renovation practices, such as shallow chiseling, can help to speed recovery of the desired plants. These practices open up the surface and thus allow the absorption of more moisture and production of the more desirable plants. Mechanical renovation, brush management, and timely deferment of grazing allow recovery of the desired plants.

Seeding may be needed in areas where the less desirable plants are dominant. A clean, firm seedbed should be prepared, suitable species should be selected for seeding, and rest periods should be long enough to allow the new plants to become established.

Special improvement practices can be effective only if the management system helps to keep the desirable plants healthy.

Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. If well managed, some forestland can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

The table "Rangeland and Grazeable Understory – Productivity and Characteristic Plant Communities" shows, for each soil suitable for forestland, the potential for producing understory vegetation. The total production of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, soil moisture is above average during the optimal part of the growing season; in a normal year, soil moisture is average; and in an unfavorable year, it is below average.

The table also lists the common names of the characteristic vegetation on each soil and the composition, by percentage of air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of forestland in which the production of wood crops is highest. The representative habitat type is an aggregation of all land areas capable of producing similar climax plant communities. The representative habitat type or phase displayed in this table is documented in "Forest Habitat Types of Montana" (Pfister and others, 1977).

Forestland

Forest Resources

Total acreage within the survey area is approximately 3,102,900 acres (NRCS, 1999). Approximately 3 percent or about 100,261 acres of the survey area are forested (O'Brien, 1991). The commercial forestland is generally of low productivity, producing less than 50 cubic feet per acre per year (MTDSL, 1984). Net volume of growing stock and sawtimber within the survey area was estimated in 1989 to be approximately 135,125,000 board feet, 81 percent of which is softwood timber (MTDNRC, 1998 and MTDSL, 1984). Approximately 44 percent of the estimated timber volume is on private land (MTDSL, 1984). The low productivity of the area, the small acreage in woodland, the young age (generally less than 100 years) of the woodlands, and the small tree diameters limit the sawtimber volume available. Harvesting of the timber resource has increased over the years. Both sawtimber and pulp wood have been removed.

Approximately 876,895 board feet of sawtimber is removed annually on non-industrial private forestland (MTDNRC, 1998). Net annual growth of growing stock and sawtimber is about 2,649,000 board feet (O'Brien, 1991). The area has an annual mortality of about 2,529,000 board feet of growing stock and sawtimber (O'Brien, 1991).

Fire Protection

The forestland within the survey area is protected from fire by the Department of Natural Resources and Conservation - Forestry Division, U.S. Department of Interior – Bureau of Land Management, and local fire districts.

Cover Types

Soils vary in their ability to support the growth of trees. Depth, fertility, texture, and the available water capacity influence tree growth. Elevation, aspect, soils, and climate determine the kinds of trees that can be expected on any site and their growth rate. Because of differences among the soils as well as differences in climate, topography, and geology, the forests vary in composition and productivity.

Ponderosa pine is the dominant cover type. Cover types of Douglas-fir, Rocky Mountain juniper, plains cottonwood, green ash, limber pine, and quaking aspen occupy lesser acreages.

Parent Material

The forested areas are generally associated with interbedded sandstone and shale of the Hell Creek, Foxhills, and Fort Union Formations; or alluvium of the Musselshell River valley.

Forested Areas

The forested areas within Garfield County can be separated into two types of forests: coniferous or deciduous.

The major part of the coniferous forest within the survey area occurs in northern and western Garfield County. The major part of the deciduous forest within the survey area occurs along the Musselshell River and its tributaries.

Elevation of the forested land within the survey area ranges from about 2,260 feet along the Musselshell River (south of Mosby) to 3,300 feet in the uplands (west of Brusset).

Coniferous Forests

The Coniferous forests in the survey area are generally associated with the Fort Union, Hell Creek, and Foxhills Formations and contain some alluvium deposits. These formations consist of interbedded sandstone and shale. The shallow to very deep soils are on moderately sloping to very steep slopes. The forested areas have varying degrees of stand density occupying these sites.

Ponderosa pine, Rocky Mountain juniper, Douglas-fir, and limber pine cover types occupy the coniferous forests within the survey area. These areas are primarily within the 10- to 14-inch precipitation zone. A Douglas fir cover type exists mainly on the northern aspects. Forest soils generally associated with the coniferous forests are the Cabbart, Busby, Twilight, and Volborg series. The associated forest understory plant community varies with precipitation, steepness of slope, aspect, overstory tree canopy density, and soils. The associated plant communities are dominated by bunchgrass habitat types.

Deciduous Forests

The deciduous forests are occupied by the plains cottonwood, green ash, and small areas of quaking aspen cover types. These forests are generally associated with alluvium along the Musselshell River valley and its tributaries. These areas are primarily within the 10- to 14-inch precipitation zone. The forested areas have varying degrees of stand density.

Plains cottonwood cover types exist along the Musselshell River and its tributaries. Some of the associated soils in the valley bottoms that support the cottonwood cover type are the Havre and Glendive series. Associated plant communities are dominated by bluebunch wheatgrass, green needlegrass, needleandthread, western wheatgrass, Canada wildrye, and rose.

Green ash cover type is associated with the cottonwoods; but is generally found along smaller drainageways and occurs on well drained soils. Associated plant communities are dominated by bluebunch wheatgrass, slender wheatgrass, western wheatgrass, common snowberry, common chokecherry, and rose.

The occasionally flooded soils of the valley bottoms are generally forested with deciduous tree species. The rarely flooded soils of the valley bottoms are occasionally forested with deciduous trees. Trees have been cleared from much of the rarely flooded and some of the occasionally flooded alluvial soil areas for crop production.

Quaking aspen are found on alluvial soils in random wet areas in the northern and western portions of the survey area. They are found in the 10- to 14-inch precipitation zone. These soils have moderate to high available water capacity and are located in positions that receive extra moisture as a result of seeps or springs. The forest understory plant community is dominated by bluebunch wheatgrass, western wheatgrass, and common snowberry.

Forest Productivity and Management

The forest-related tables can help forest owners or managers plan the use of soils for wood crops. They show the potential productivity of the soils for wood crops and rate the soils according to the limitations that affect various aspects of forest management.

Forest Productivity

In the “Woodland Productivity” table the *potential productivity* of merchantable or *common trees* on a soil is expressed as a site index and as a volume number. The *site index* is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that forest managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability. More detailed information regarding site index is available in the “National Forestry Manual,” which is available in local offices of the Natural Resources Conservation Service or on the Internet at www.soils.usda.gov/technical/nfmanual.

The *volume of wood fiber*, a number, is the yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmination of the mean annual increment (CMAI), indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Suggested trees to plant are those that are preferred for planting, seeding, or natural regeneration and those that remain in the stand after thinning or partial harvest.

Forest Management

Other tables provide interpretive ratings for various aspects of forest management. The ratings are both verbal and numerical.

Some rating class terms indicate the degree to which the soils are suited to a specified forest management practice. *Well suited* indicates that the soil has features that are favorable for the specified practice and has no limitations. Good performance can be expected, and little or no maintenance is needed. *Moderately well suited* indicates that the soil has features that are moderately favorable for the specified practice. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. *Poorly suited* indicates that the soil has one or more properties that are unfavorable for the specified practice. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. *Unsuited* indicates that the expected performance of the soil is unacceptable for the specified practice or that extreme measures are needed to overcome the undesirable soil properties.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified forest management practice (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating class terms for fire damage and seedling mortality are expressed as *low*, *moderate*, and *high*. Where these terms are used, the numerical ratings indicate gradations between the point at which the potential for fire damage or seedling mortality is highest (1.00) and the point at which the potential is lowest (0.00).

The paragraphs that follow indicate the soil properties considered in rating the soils for forest management practices. More detailed information about the criteria

used in the ratings is available in the "National Forestry Manual," which is available in local offices of the Natural Resources Conservation Service or on the Internet at www.soils.usda.gov/technical/nfmanual.

For *limitations affecting construction of haul roads and log landings*, the ratings are based on slope, flooding, permafrost, plasticity index, the hazard of soil slippage, content of sand, the Unified classification, rock fragments on or below the surface, depth to a restrictive layer that is indurated, depth to a water table, and ponding. The limitations are described as slight, moderate, or severe. A rating of *slight* indicates that no significant limitations affect construction activities, *moderate* indicates that one or more limitations can cause some difficulty in construction, and *severe* indicates that one or more limitations can make construction very difficult or very costly.

The ratings of *suitability for log landings* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, ponding, flooding, and the hazard of soil slippage. The soils are described as well suited, moderately suited, or poorly suited to use as log landings.

Ratings in the column *soil rutting hazard* are based on depth to a water table, rock fragments on or below the surface, the Unified classification, depth to a restrictive layer, and slope. Ruts form as a result of the operation of forest equipment. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that the soil is subject to little or no rutting, *moderate* indicates that rutting is likely, and *severe* indicates that ruts form readily.

Ratings in the column *hazard of off-road or off-trail erosion* are based on slope and on soil erodibility factor K. The soil loss is caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed by logging, grazing, mining, or other kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. A rating of *slight* indicates that erosion is unlikely under ordinary climatic conditions; *moderate* indicates that some erosion is likely and that erosion-control measures may be needed; *severe* indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and *very severe* indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Ratings in the column *hazard of erosion on roads and trails* are based on the soil erodibility factor K, slope, and content of rock fragments. The ratings apply to unsurfaced roads and trails. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that little or no erosion is likely; *moderate* indicates that some erosion is likely, that the roads or trails may require occasional maintenance; and that simple erosion-control measures are needed; and *severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Ratings in the column *suitability for roads (natural surface)* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, ponding, flooding, and the hazard of soil slippage. The ratings indicate the suitability for using the natural surface of the soil for roads. The soils are described as well suited, moderately well suited, or poorly suited to this use.

Ratings in the columns *suitability for hand planting* and *suitability for mechanical planting* are based on slope, depth to a restrictive layer, content of sand, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, moderately well suited, poorly suited, or

unsuited to these methods of planting. It is assumed that necessary site preparation is completed before seedlings are planted.

Ratings in the column *suitability for use of harvesting equipment* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification, depth to a water table, and ponding. The soils are described as well suited, moderately well suited, or poorly suited to this use.

Ratings in the column *suitability for mechanical site preparation (surface)* are based on slope, depth to a restrictive layer, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, poorly suited, or unsuited to this management activity. The part of the soil from the surface to a depth of about 1 foot is considered in the ratings.

Ratings in the column *suitability for mechanical site preparation (deep)* are based on slope, depth to a restrictive layer, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, poorly suited, or unsuited to this management activity. The part of the soil from the surface to a depth of about 3 feet is considered in the ratings.

Ratings in the column *potential for damage to soil by fire* are based on texture of the surface layer, content of rock fragments and organic matter in the surface layer, thickness of the surface layer, and slope. The soils are described as having a low, moderate, or high potential for this kind of damage. The ratings indicate an evaluation of the potential impact of prescribed fires or wildfires that are intense enough to remove the duff layer and consume organic matter in the surface layer.

Ratings in the column *potential for seedling mortality* are based on flooding, ponding, depth to a water table, content of lime, reaction, salinity, available water capacity, soil moisture regime, soil temperature regime, aspect, and slope. The soils are described as having a low, moderate, or high potential for seedling mortality.

Recreation

The soils of the survey area are rated in the “Camp Areas, Picnic Areas, and Playgrounds” and “Paths, Trails, and Golf Fairways” tables according to limitations that affect their suitability for recreation. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Slightly limited* indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in the tables can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas.

The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb

rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a zone in which soil moisture status is wet, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a zone in which soil moisture status is wet, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a zone in which soil moisture status is wet, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a zone in which soil moisture status is wet, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a zone in which soil moisture status is wet, ponding, flooding, and texture of the surface layer.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a zone in which soil moisture status is wet; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a zone in which soil moisture status is wet, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In the "Wildlife Habitat" table, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated *good*, *fair*, *poor*, or *very poor*. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs:

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are considerations. Examples of grasses and legumes are fescue, lovegrass, brome grass, clover, and alfalfa.

Native herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Native deciduous trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian olive, autumn olive, and crabapple.

Planted woody plants require cultivation before and during establishment. They can provide fruit, buds, twigs, bark, and foliage. Soil properties that affect the growth of trees and shrubs are depth of the root zone, available water capacity, salinity, and wetness. Examples of these trees and shrubs are green ash, Russian olive, plum, chokecherry, Rocky Mountain juniper, and eastern redcedar.

Native coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Native shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountain mahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs:

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, deer, sage grouse, meadowlark, and lark bunting.

Engineering

This section provides information for planning land uses related to urban and rural development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, water management, and waste management. The ratings are based on observed performance of the soils and on the estimated data and test data in the “Soil Properties” section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the “Glossary”.

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. The “Dwellings and Small Commercial Buildings” and “Roads and Streets, Shallow Excavations, and Lawn and Landscaping” tables show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the tables are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Slightly limited* indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

The “Sewage Disposal” and “Landfills” tables show the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Slightly limited* indicates that the soil has features that are favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A trench sanitary landfill is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when

wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an *area sanitary landfill*, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Construction Materials

The "Source of Gravel and Sand" and "Reclamation Material, Roadfill, and Topsoil" tables give information about the soils as potential sources of gravel, sand, reclamation material, roadfill, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

The soils are rated *good*, *fair*, or *poor* as potential sources of topsoil, reclamation material, and roadfill. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation.

The soils are rated as a *probable* or *improbable* source of gravel and sand. A rating of *probable* means that the source material is likely to be in or below the soil.

The numerical ratings in these columns indicate the degree of probability. The number 0.00 indicates that the soil is an improbable source. A number between 0.00 and 1.00 indicates the degree to which the soil is a probable source of sand or gravel.

Gravel and *sand* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the "Source of Gravel and Sand" table, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the lowest layer of the soil contains sand or gravel, the soil is rated as a probable source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

The “Water Management” table gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, a cemented pan, or other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by

depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Agricultural Waste Management

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

The "Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge," "Agricultural Disposal of Wastewater by Irrigation and Overland Flow," and "Agricultural Disposal of Wastewater by Rapid Infiltration and Slow Rate Treatment" tables show the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of these tables, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the tables are for waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops (application of manure and food-processing waste, application of sewage sludge, and disposal of wastewater by irrigation) and for waste management systems that are designed only for the purpose of wastewater disposal and treatment (overland flow of wastewater, rapid infiltration of wastewater, and slow rate treatment of wastewater).

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. *Not limited* indicates that the soil has features that are very favorable

for the specified use. Good performance and very low maintenance can be expected. *Slightly limited* indicates that the soil has features that are generally favorable for the specified use. The limitations are minor and can be easily overcome. Good performance and low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are either solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available

water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Disposal of wastewater by irrigation not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings in the table are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

Overland flow of wastewater is a process in which wastewater is applied to the upper reaches of sloped land and allowed to flow across vegetated surfaces, sometimes called terraces, to runoff-collection ditches. The length of the run generally is 150 to 300 feet. The application rate ranges from 2.5 to 16.0 inches per week. It commonly exceeds the rate needed for irrigation of cropland. The wastewater leaves solids and nutrients on the vegetated surfaces as it flows downslope in a thin film. Most of the water reaches the collection ditch, some is lost through evapotranspiration, and a small amount may percolate to the ground water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, and the design and construction of the system. Reaction and the cation-exchange capacity affect absorption. Reaction, salinity, and the sodium adsorption ratio affect plant growth and microbial activity. Slope, permeability, depth to a water table, ponding, flooding, depth to bedrock or a cemented pan, stones, and cobbles affect design and construction. Permanently frozen soils are unsuitable for waste treatment.

Rapid infiltration of wastewater is a process in which wastewater applied in a level basin at a rate of 4 to 120 inches per week percolates through the soil. The wastewater may eventually reach the ground water. The application rate commonly exceeds the rate needed for irrigation of cropland. Vegetation is not a necessary part of the treatment; hence, the basins may or may not be vegetated. The thickness of the soil material needed for proper treatment of the wastewater is more than 72 inches. As a result, geologic and hydrologic investigations are needed to ensure proper design and performance and to determine the risk of ground water pollution.

The ratings in the table are based on the soil properties that affect the risk of pollution and the design, construction, and performance of the system. Depth to a water table, ponding, flooding, and depth to bedrock or a cemented pan affect the risk of pollution and the design and construction of the system. Slope, stones, and cobbles also affect design and construction. Permeability and reaction affect performance. Permanently frozen soils are unsuitable for waste treatment.

Slow rate treatment of wastewater is a process in which wastewater is applied to land at a rate normally between 0.5 inch and 4.0 inches per week. The application rate commonly exceeds the rate needed for irrigation of cropland. The applied wastewater is treated as it moves through the soil. Much of the treated water may percolate to the ground water, and some enters the atmosphere through evapotranspiration. The applied water generally is not allowed to run off the surface.

Waterlogging is prevented either through control of the application rate or through the use of tile drains, or both.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, and the application of waste. The properties that affect absorption include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, depth to bedrock or a cemented pan, reaction, the cation-exchange capacity, and slope. Reaction, the sodium adsorption ratio, salinity, and bulk density affect plant growth and microbial activity. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood of wind erosion or water erosion. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The “Engineering Index Properties” table gives estimates of the engineering classifications and the range of index properties for the layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example “gravelly”. Textural terms are defined in the “Glossary.”

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1998) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1998).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH;

and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical and Chemical Properties

The "Physical Properties of the Soils" and "Chemical Properties of the Soils" tables show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

The following paragraphs describe the columns in the table "Physical Properties of the Soils".

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the "Physical Properties of the Soils" table, the estimated moist bulk density of

each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Ksat (permeability) refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are low, a change of less than 3 percent; moderate, 3 to 6 percent; and high, more than 6 percent. Very high, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table "Physical Properties of the Soils," the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor Kw indicates the susceptibility of a soil to sheet and rill erosion. Factor Kw is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of Kw range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.
5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control soil blowing are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control soil blowing are used.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
8. Soils that are not subject to soil blowing because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to soil blowing, or the tons per acre per year that can be expected to be lost to soil blowing. There is a close correlation between soil blowing and the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence soil blowing.

The following paragraphs describe the columns in the table "Chemical Properties of the Soils."

Cation-exchange capacity is 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. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of

fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the soil. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is given as the percent, by weight, of hydrated calcium sulfates in the soil. Gypsum is partially soluble in water and can be dissolved and removed by water. Soils that have a high content of gypsum (more than 10 percent) may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio is the measure of sodium relative to calcium and magnesium in the water extract from saturated soil paste. Soils having a sodium adsorption ratio of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

The "Water Features" table gives estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. The table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The "Water Features" table indicates *surface water depth* and the *duration and frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and frequency are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

The “Soil Features” table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. Depth to top is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

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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.

Alder thickets. A tall, deciduous shrub community similar to willow shrub-carrs except that tag alder (speckled alder) is dominant.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

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
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

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, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial or glacial lake.

Beach ridge. A low, essentially continuous mound of beach or beach-and-dune material accumulated by the action of waves and currents on the backshore of a

beach, beyond the present limit of storm waves or the reach of ordinary tides, and occurring singly or as one of a series of approximately parallel deposits. The ridges are roughly parallel to the shoreline and represent successive positions of an advancing shoreline.

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-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

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.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of gravel or cobbles. In some blowouts wet soil is exposed.

Board foot. A unit of measurement represented by a board 1 foot wide, 1 foot long, and 1 inch thick.

Bog. Waterlogged, spongy ground, consisting primarily of mosses, containing acidic, decaying vegetation such as sphagnum, sedges, and heaths, that develops into peat.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a 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.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

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.

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 through the 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.

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.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

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.

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.

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.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

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.

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.

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 surface after planting in order to reduce the hazard of water erosion; in areas where wind erosion is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or its 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.

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.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Cord. A unit of measurement of stacked wood. A standard cord occupies 128 cubic feet with dimensions of 4 feet by 4 feet by 8 feet.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

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.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Depression. Any relatively sunken part of the Earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage. An open depression has a natural outlet for surface drainage.

Depth, soil. The thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Disintegration moraine. A drift topography characterized by chaotic mounds and pits, generally randomly oriented, developed in supraglacial drift by collapse and flow as the underlying stagnant ice melted. Slopes may be steep and unstable. Abrupt changes between materials of differing lithology are common.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

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 or high 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 most field crops are affected. 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 under natural conditions. 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. Poor drainage is 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 for rice) under natural conditions.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. Relatively small, linear depressions that, at some time, move concentrated water and either lack a defined channel or have a small, defined channel.

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 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.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

End moraine. A ridge-like accumulation that is being or was produced at the outer margin of an actively flowing glacier at any given time.

Eolian deposits. 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 a zone in which the soil moisture status is wet at all times.

Episaturation. A type of saturation indicating a perched zone in which the soil moisture status is wet in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

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, such as a 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 1 mile to more than 100 miles in length and from 10 to 100 feet in height.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

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. It 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 generally a constructional landform consisting of sediment deposited during overflow and lateral migration of the stream.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

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 habitat type. An association of dominant tree and ground flora species in a climax community.

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.

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.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial drift. 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. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits. 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.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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 (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. Water filling all the unblocked pores of underlying material below the top of where the soil moisture status is wet.

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.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

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.

Herbaceous peat. An accumulation of organic material, decomposed to some degree, that is predominantly the remains of sedges, reeds, cattails and other herbaceous plants.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

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 6 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.

E horizon.--The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

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.

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, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.--Soft, consolidated bedrock beneath the soil.

R layer.--Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it 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 zone with wet soil moisture status high in the profile on a permanent basis, 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.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted, the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

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 the 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

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

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

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a

clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

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 zone with wet soil moisture status 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 moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Lamella. A thin (commonly less than 1 cm thick), discontinuous or continuous, generally horizontal layer of fine material (especially clay and iron oxides) that have been pedogenically concentrated (illuviated within a coarser (e.g. sandy), eluviated layers (several centimeters to several decimeters thick).

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.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility percent (in tables). The linear expression of the volume difference of natural soil fabric at 1/3-bar or 1/10-bar water content and oven dryness. The volume change is reported as percent change for the whole soil.

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.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops 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.

MAP. Mean annual precipitation, expressed in inches.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

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.

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.

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.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform 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. 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).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mucky peat. Unconsolidated soil material consisting primarily of organic matter that is in an intermediate stage of decomposition such that a significant part of the material can be recognized and a significant part of the material can not be recognized.

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.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

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.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Parts per million (ppm). The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

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.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

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 movement of water through the soil.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of micrometers per second that water moves downward through the saturated soil. Terms describing permeability are:

Extremely slow	less than 0.01
Very slow	0.01 to 0.42
Slow	0.42 to 1.41
Moderately slow	1.41 to 4.23
Moderate	4.23 to 14.11
Moderately rapid	14.11 to 42.34
Rapid	42.34 to 141.14
Very rapid	141.14 to 444.6

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.)

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses; many are found in Wisconsin and Minnesota.

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.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Poletimber. Hardwood trees ranging from 5 to 11 inches and conifers ranging from 5 to 9 inches in diameter at breast height.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

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.

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. Burning an area under conditions of weather and soil moisture and at the time of day that 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.

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.

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:

Extremely acid	less than 4.5
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

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

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.

Rise. A slight increase in elevation of the land surface, usually with a broad summit and gently sloping sides.

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.

Root zone. The part of the soil that can be penetrated by plant roots.

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.

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.

Sapling. A tree ranging from 1 to 5 inches in diameter at breast height.

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.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawtimber. Hardwood trees more than 11 inches and conifers more than 9 inches in diameter at breast height.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

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.

Seedling. A tree less than 1 inch in diameter at breast height.

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. 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.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Sideslope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

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 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 and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

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.

Slickspot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.

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.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

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 substratum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly, but not always, occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of rock 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.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion 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 the soil from wind and water erosion after harvest, during

preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsidence. The potential decrease in surface elevation as a result of the drainage of wet soils that have organic layers or semi-fluid, mineral layers. Subsidence, as a result of drainage, is attributed to (1) shrinkage from drying, (2) consolidation because of the loss of ground-water buoyancy, (3) compaction from tillage or manipulation, (4) wind erosion, (5) burning, and (6) biochemical oxidation.

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 restricts roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

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."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine due to uneven glacial deposition.

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."

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating or gently sloping soils that are underlain by till or consist of till. Slopes are 0 to 6 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

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.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

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.

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.

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.

Willow shrub-carrs. Plant communities composed of tall, deciduous shrubs growing on saturated to seasonally flooded soils. They are usually dominated by willow.

Windthrow. The uprooting and tipping over of trees by the wind.

Woody peat. An accumulation of organic material that is predominantly composed of trees, shrubs, and other woody plants.

Tables

Temperature and Precipitation

(Recorded in the period 1961-2000 at Cohagen, Jordan, and Mosby.)

Month	Temperature (Degrees F.)						Precipitation (Inches)				
				2 yrs in 10 will have		avg		2 yrs in 10 will have		avg	
						# of				# of	
	avg daily max	avg daily min	avg	max temp. >than	min temp. <than	grow deg days*	avg	less than	more than	w/.1 or more	avg total snow fall
COHAGEN											
January	29.9	5.3	17.6	56	-35	3	0.44	0.13	0.69	1	6.0
February	37.3	11.9	24.6	64	-30	13	0.25	0.09	0.40	1	4.5
March	47.9	20.9	34.4	73	-18	58	0.49	0.27	0.70	1	4.7
April	60.4	30.2	45.3	85	6	207	1.01	0.35	1.54	2	2.9
May	70.3	40.2	55.2	93	22	473	2.09	1.09	2.88	5	1.0
June	79.8	49.1	64.5	100	32	733	2.07	0.93	3.12	5	0.0
July	87.3	53.5	70.4	105	39	940	1.65	0.50	2.61	3	0.0
August	86.9	52.3	69.6	103	34	917	1.07	0.38	1.59	2	0.0
September	75.1	41.2	58.1	99	19	546	1.32	0.39	2.03	2	0.2
October	62.1	31.0	46.5	87	4	247	0.91	0.30	1.45	2	1.0
November	43.4	18.3	30.8	71	-17	41	0.42	0.16	0.65	1	4.0
December	33.2	8.4	20.8	61	-34	7	0.45	0.16	0.74	1	6.1
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Yearly :	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
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Average	59.5	30.2	44.8	---	---	---	----	----	----	---	---
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Extreme	109	-42	---	105	-39	---	----	----	----	---	---
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Total	---	---	---	---	---	4186	12.18	9.30	14.99	26	30.4
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JORDAN											
January	28.9	3.9	16.4	55	-36	2	0.53	0.18	0.83	2	1.9
February	36.8	10.9	23.9	64	-31	12	0.34	0.06	0.59	1	2.3
March	48.3	20.8	34.5	74	-18	58	0.60	0.34	0.83	2	0.4
April	61.1	30.7	45.9	85	9	217	1.00	0.40	1.50	3	0.3
May	71.9	40.9	56.4	94	23	503	2.19	1.05	3.30	5	0.1
June	81.5	50.1	65.8	100	34	766	2.30	1.10	3.31	5	0.0
July	88.8	54.5	71.7	104	40	979	1.77	0.71	2.53	3	0.0
August	88.7	53.1	70.9	104	35	942	1.12	0.43	1.72	2	0.0
September	76.1	41.5	58.8	99	20	566	1.31	0.35	2.01	3	0.0
October	62.7	30.9	46.8	88	6	248	0.87	0.25	1.41	2	0.0
November	43.1	17.7	30.4	71	-16	31	0.41	0.13	0.65	1	0.8
December	32.2	7.2	19.7	60	-36	5	0.50	0.16	0.80	1	1.0
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Yearly :	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
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Average	60.0	30.2	45.1	---	---	---	----	----	----	---	---
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Extreme	109	-46	---	105	-40	---	----	----	----	---	---
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Total	---	---	---	---	---	4328	12.92	8.60	15.92	30	6.9
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*See footnote at end of table.

Temperature and Precipitation--Continued

Month	Temperature (Degrees F.)						Precipitation (Inches)				
	avg daily max	avg daily min	avg	2 yrs in 10 will have		avg # of grow deg days*	avg	2 yrs in 10 will have		avg # of days w/.1 or more	avg total snow fall
				max temp. >than	min temp. <than			less than	more than		
MOSBY											
January	32.5	8.5	20.5	59	-27	7	0.53	0.21	0.80	2	4.5
February	38.7	13.9	26.3	67	-26	24	0.34	0.15	0.48	1	3.1
March	48.8	23.8	36.3	75	-11	74	0.68	0.32	1.04	2	3.4
April	59.7	32.8	46.2	86	11	231	1.10	0.40	1.75	3	2.1
May	69.3	42.4	55.8	92	27	488	2.64	1.60	3.54	6	1.0
June	79.8	51.2	65.5	99	36	747	2.11	1.10	2.98	5	0.0
July	87.8	56.0	71.9	103	41	973	1.69	0.48	2.71	4	0.0
August	87.3	55.1	71.2	103	40	943	1.09	0.42	1.67	3	0.0
September	74.3	43.9	59.1	97	25	565	1.32	0.34	1.93	3	0.1
October	63.0	34.3	48.6	87	12	293	0.83	0.28	1.35	2	1.3
November	45.5	21.6	33.6	75	-10	64	0.43	0.13	0.69	1	2.9
December	35.8	11.9	23.8	64	-31	17	0.44	0.12	0.69	1	4.7
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Yearly :	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Average	60.2	33.0	46.6	---	---	---	----	----	----	----	----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Extreme	108	-43	---	105	-35	---	----	----	----	----	----
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Total	---	---	---	---	---	4426	13.20	9.26	15.36	33	23.1
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*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (Threshold: 40.0 deg. F)

Growing Season

(Recorded in the period 1971-2000 in Cohagen, Jordan, and Mosby.)

Probability	Daily Minimum Temperature		
	# days > 24F	# days > 28F	# days > 32F
COHAGEN			
9 years in 10	133	112	92
8 years in 10	141	119	98
5 years in 10	154	133	110
2 years in 10	168	146	122
1 year in 10	175	153	128
JORDAN			
9 years in 10	140	119	101
8 years in 10	148	126	107
5 years in 10	163	138	120
2 years in 10	178	151	133
1 year in 10	185	158	140
MOSBY			
9 years in 10	149	139	120
8 years in 10	160	146	126
5 years in 10	180	160	136
2 years in 10	201	174	146
1 year in 10	212	181	152

Freeze Dates in Spring and Fall

(Recorded in the period 1967-1990 in Cohagen, Jordan, and Mosby.)

Probability	Temperature		
	24F or lower	28F or lower	32F or lower
COHAGEN			
Last freezing temperature in spring:			
1 year in 10 later than----	May 11	May 25	June 7
2 years in 10 later than---	May 7	May 19	June 2
5 years in 10 later than---	April 29	May 9	May 22
First freezing temperature in fall:			
1 year in 10 earlier than--	September 13	September 5	August 27
2 years in 10 earlier than-	September 19	September 10	September 1
5 years in 10 earlier than-	September 30	September 19	September 10
JORDAN			
Last freezing temperature in spring:			
1 year in 10 later than----	May 10	May 19	June 2
2 years in 10 later than---	May 5	May 14	May 27
5 years in 10 later than---	April 26	May 5	May 17
First freezing temperature in fall:			
1 year in 10 earlier than--	September 18	September 6	August 31
2 years in 10 earlier than-	September 23	September 12	September 4
5 years in 10 earlier than-	October 4	September 22	September 14
MOSBY			
Last freezing temperature in spring:			
1 year in 10 later than----	April 30	May 9	May 26
2 years in 10 later than---	April 25	May 4	May 21
5 years in 10 later than---	April 15	April 25	May 11
First freezing temperature in fall:			
1 year in 10 earlier than--	September 28	September 18	September 10
2 years in 10 earlier than-	October 5	September 23	September 15
5 years in 10 earlier than-	October 18	October 3	September 24

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