



United States
Department of
Agriculture

In cooperation with
Montana Agricultural
Experiment Station

Natural Resources
Conservation
Service

Soil Survey of Chouteau County Area, Montana Part I



How to Use This Soil Survey

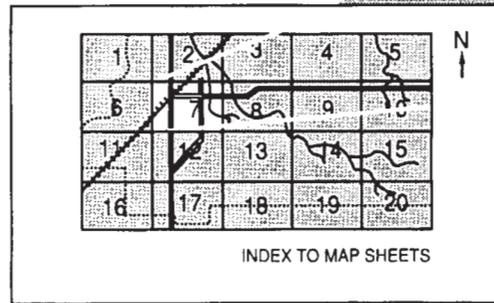
This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the detailed soil map units and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties.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

Detailed Soil Maps

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

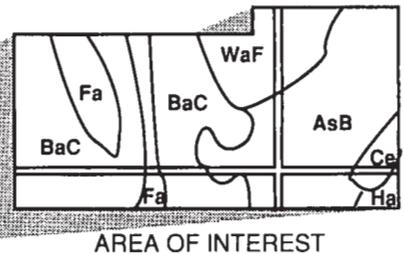
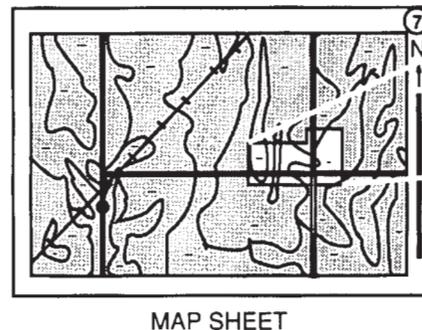
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

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



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

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



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

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

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

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service; United States Department of the Interior, Bureau of Indian Affairs; and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Chouteau County Conservation District, Big Sandy Conservation District, and the Chippewa-Cree Tribal Council.

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

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**Cover: White Rocks area of the Missouri River. This area is designated as wild and scenic river.
(Photo by C.P. Heidlebaugh, Loma, Montana.)**

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

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Foreword

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

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

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

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

Shirley Gammon
State Conservationist
Natural Resources Conservation Service

Soil Survey of Chouteau County Area, Montana

Fieldwork by Rebecca L. Bronec, Michael F. Browne, Barry R. Cohn, Charles C. French, Mary A. Grande, Patricia O'Byrne Haven, Donna L. Hinz, Jan Larson, Richard M. Saunders, and Neal R. Svendsen, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with the United States Department of Interior, Bureau of Indian Affairs;
and the Montana Agricultural Experiment Station

How This Survey Was Made

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

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

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

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and

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

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

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

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

General Nature of the Survey Area

The Chouteau County Area soil survey is in the north-central part of Montana (fig. 1). It has a total area of about 2,526,082 acres, or 3,947 square miles. The Chouteau County Area has a wide variety of topography that is characterized by level to rolling till plains over much of the county. Three major rivers, the Missouri, Marias, and Teton, flow through the survey area. The Bearpaw Mountains are in the northeastern part and the Highwood Mountains are in the southern part.

About 52 percent of the county is used as cropland, 46 percent is rangeland, and 2 percent is woodland. The principal crops are dryland wheat and barley. The

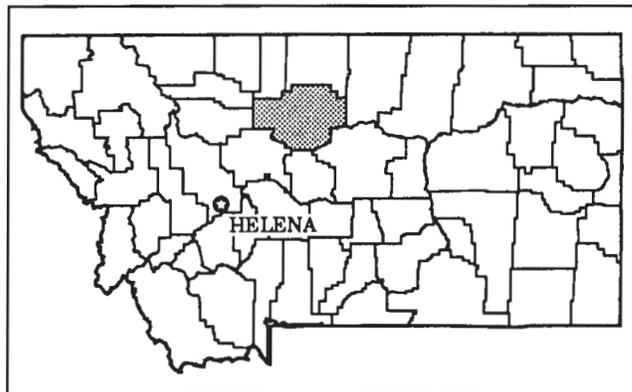


Figure 1. Location of Chouteau County in Montana.

main economic enterprises are growing small grains and raising beef cattle.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey area.

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

History

The area that is now Chouteau County was largely inhabited by Indian tribes of the Blackfeet Nation when the Lewis and Clark expedition journeyed through the area in 1805. Conflicts with these tribes prevented the establishment of trading posts until an agreement was reached with the American Fur Company in 1830. Afterwards, forts to exchange animal pelts for goods were built along the Marias and Missouri Rivers, serving both white and Indian traders. Many of these forts were subsequently abandoned as hostilities with the Indians arose. Fort Benton was established in 1850 and named after Senator Thomas Benton.

In 1860, 55 years after Lewis and Clark explored the route of the Missouri River, the first steamboat reached Fort Benton from St. Louis, Missouri. The town, being on the longest river in North America, became the head of navigation and a major connection to the Northwest Territories. The chief items of trade were gold, buffalo hides, high grade ore, Indian blankets, guns, and whiskey. The gold stampede from 1867 to 1869, marked the height of the boom period for Fort Benton river trade, with thousands of miners coming in

and tons of gold dust and freight going out. September 29, 1887, marked the demise of the Missouri River traffic when the Manitoba Railway (later the Great Northern) drove its silver spike at Fort Benton.

As river trade faded, the livestock boom began and thousands of Texas long-horned cattle were brought to Chouteau County on the Chisholm Trail. Records show that in 1885, 100,000 cattle, 60,000 sheep, and 10,000 horses ranged south of the Marias River. The following year severe winter blizzards claimed 50 to 95 percent of the herds, which became prey of the open range. By the mid 1890s, Fort Benton arose as a major stock shipping point and also handled large volumes of wool.

Extensive settlement of the Chouteau County area began in the early 1900s, intensified by the Homestead Act of 1909. By 1913 most of the arable land was in private ownership. Steam powered engines were tilling the soil in the Carter area, and the days of the open range were over. Small grain farming prospered until the early 1920s, when bank collapse broke hundreds of homesteaders. This was due to inflated land values, unhealthy farming practices, and poor economic policies. Those who survived the crash improved their dryland farming techniques and continued to harvest high yields of small grains. By the mid 1920s, Chouteau County became the largest wheat producing county in Montana, and still consistently raises 10 percent of the state total. Both winter and spring wheat are grown as well as barley, oats, sunflower, safflower, alfalfa, and various certified seeds.

The Montana Territorial legislature established Chouteau County, named for Pierre Chouteau of the American Fur Company, on February 2, 1865. Fort Benton is the county seat. Other population centers are Loma, Big Sandy, Carter, Geraldine, and Highwood. The northern part of the county, in the Bearpaw Mountains, is home to the Chippewa-Cree tribe on the Rocky Boy Indian Reservation. Chouteau County also contains part of the Lewis and Clark National Forest, located in the Highwood Mountains to the south; and is the gateway to the 150 mile "Wild and Scenic" portion of the Missouri River.

Industry, Transportation, and Recreation

Growing crops and raising livestock, along with associated services, are the main industries in Chouteau County. Dryland farming is predominate throughout most of the survey area with limited irrigated crops along the rivers and streams. Winter wheat is the principal crop but spring wheat, barley, oats, oilseed crops, and alfalfa are also grown. Beef cattle production is important in the foothills of the

Bearpaw and Highwood Mountains, and also in the eastern part of the county. Occasionally, timber is harvested on a small scale in the Bearpaw and Highwood Mountains.

Nearly all the small grain produced is marketed through local elevators and shipped by rail or truck to west coast markets. Fort Benton, Big Sandy, Loma, Carter, and Geraldine have facilities for handling grain. The Burlington Northern Railroad and Montana Raillink serve Chouteau County with freight service. Federal highway 89 follows through the county from southwest of Carter through Big Sandy in the northeast. State highway 80 travels from Fort Benton, southeast through Geraldine and beyond. Secondary state highways provide paved vehicle traffic from northwest of Fort Benton, to west and southeast of Big Sandy. The county has numerous all weather, graveled county roads.

Recreational opportunities in the Chouteau County area are highlighted by the Missouri River. Designated as "Wild and Scenic" below Fort Benton, the Missouri flows through spectacular white sandstone cliffs of the Virgelle Sandstone formation. Many other scenic, natural, and historic sites occur along the Missouri River including Hole in the Wall, Citadel Rock, buffalo jumps, and various fort and camp sites. Hundreds of visitors float the Missouri River every year. Trout fishing is available in the county's rivers, streams, and private ponds. Warm water species are fished in the Marias and Missouri Rivers. Deer hunting, along with antelope and upland game birds, is done throughout the county on both private and public lands. Elk are hunted in the Bearpaw and Highwood Mountains, and mountain goats hunted on Square Butte. Fort Benton also has a top rated nine-hole golf course.

Physiography, Drainage, Ground Water Resources, Oil and Gas, and Economic Deposits

The Chouteau County Area lies within the Great Plains physiographic province in north-central Montana, near the southern margin of the glaciated Missouri Plains. The area consists predominantly of gently rolling plains that are dissected in the central portion by the Missouri River. Included within the area are portions of two small, isolated mountain ranges: the Bearpaw Mountains in the northeast corner of the county, and the Highwood Mountains which extend into the southern portion.

Surface elevations in the survey area range from approximately 2,450 feet to over 7,500 feet above sea level. The glaciated uplands have an average elevation

of 2,700 to 3,600 feet, with relatively low relief. The Bearpaw Mountains to the northeast rise to a maximum elevation of 6,250 feet at Pecora Ridge. The Highwood Mountains to the south rise to a maximum elevation of 7,625 feet at Highwood Baldy, and include the isolated buttes of Square Butte and Round Butte at elevations of 5,684 and 5,350 feet respectively.

The Missouri River flows generally eastward through the central portion of the survey area, controlling drainage within the area. The Teton River and the Marias River join the Missouri in central Chouteau County, between Fort Benton and Loma. The other major tributaries to the Missouri River are, listed from west to east, Belt Creek, Highwood Creek, Huntley Coulee, Shonkin Creek, Crow Coulee, Little Sandy Creek, Eagle Creek, Flat Creek, Chip Creek, and Birch Creek. Smaller intermittent streams drain the intermediate areas.

Ground water in the Chouteau County area is obtained from three different aquifers: sandstone bedrock, glacial outwash deposits, and river alluvium. The most important bedrock aquifers are the Kootenai, Eagle, and Judith River Formations, and significant volumes are also recovered from unconsolidated deposits. In addition, groundwater can be developed at springs which are numerous along the surface traces of faults and volcanic/sedimentary contacts. Springs and unconsolidated aquifers of glacial and alluvial gravels commonly produce the best quality water, however wells in shallow aquifers are subject to contamination.

The ground water development potential for each formation exposed in Chouteau County will be discussed below, from oldest to youngest.

The Kootenai Formation is used extensively as an artesian aquifer in the southwestern portion of the county. Its thicker sandstone beds yield moderate to large quantities of artesian water. It underlies up to 1,800 feet of the Colorado Group, and its water is highly mineralized with sodium sulfate.

The Colorado Group and the overlying Telegraph Creek Formation are relatively impermeable and highly mineralized with substantial concentrations of sulfates and selenium. They do not yield useable water to wells in the area. Surface water is highly mineralized as well, and has contributed to the major saline seep problem near Geraldine and on the Highwood Bench in the southern part of the survey area. This near-surface ground water can also contain high concentrations of trace metals and nitrates.

Within the Montana Group, only the Eagle and the Judith River Formations contain useable quantities of fresh water. Any water contained within the nearly

impermeable marine shale formations is too mineralized for use. The Judith River usually yields 5 to 15 gallons per minute (gpm) of soft, sodium bicarbonate water. The upper Eagle Formation usually yields small (2 to 5 gpm) amounts of water, however the lower Virgelle Sandstone Member yields 8 to 20 gpm. The water becomes more mineralized to the northeast, and eventually produces natural gas as well.

The Hell Creek and Fox Hills Formations are present in localized areas near the mountains, and while their total volume is small they will usually yield 3 to 20 gpm of mineralized water. Small volumes of relatively mineralized water can sometimes be developed from the overlying Fort Union Formation.

The igneous rocks exposed in the Bearpaw and Highwood Mountains are dense and impermeable. Small amounts of good quality water can sometimes be developed from interflow surfaces and fractured zones.

The five producing gas fields in the Chouteau County area are Buffalo Flats, Camp Creek, Hardpan, Little Creek Area, and Sherard. The Buffalo Flats also produce crude oil. These fields are producing from oil and gas trapped by the Bearpaw Uplift in the Judith River, Eagle/Virgelle, and Bow Island Formations. While Chouteau County is not a significant oil and gas producing county, the largest gas field in Montana, the Tiger Ridge field, lies to the northeast in Hill and Blaine Counties.

Known economic deposits of the Chouteau County area are limited to minor amounts of coal, bentonite, sand, and gravel. Small amounts of lignite have been locally mined from the top of the Judith River, Eagle, and Fort Union Formations. The coal beds range from a few inches to 2.5 feet in thickness, and their potential for development is limited by their size and variable areal extent. There are no strippable coal fields in the county.

Glaciofluvial and terrace alluvium gravel deposits are mined for sand and gravel.

Geology

The oldest rocks exposed in the Chouteau County area are sedimentary formations which were deposited during the Lower Cretaceous Period, beginning approximately 135 million years ago. They were deposited on coastal plains and the floor of a shallow sea as its shoreline moved back and forth across what is now central Montana. These rocks consist of a very thick sequence of shales and sandstones, which were later disrupted by igneous

activity during the Tertiary Period, beginning approximately 65 million years ago. Since the end of the volcanic period, only minor deformation has occurred and the sedimentary rocks are generally undisturbed, except near the igneous intrusions which make up the mountains. Today, the sedimentary rocks are relatively flat-lying, dipping from 1/2 to 3 degrees to the northeast.

The Highwood and Bearpaw Mountains are similar geologically and were formed in the mid-Eocene Epoch, a time of intense volcanic activity and mountain building which began approximately 50 million years ago. The geology of both mountain ranges has been studied extensively since the 1890s when W.H. Weed and L.V. Pirsson began publishing geologic maps and papers about the area.

These mountains are made up of a thick pile of igneous rocks. They are composed of a wide variety of intrusive and extrusive rock types, including some rare potassium and sodium-rich rocks. Included in these rock types is shonkinite, a dark, potassium-rich intrusive rock. This name was originated in an 1895 paper by Weed and Pirsson, who derived it from the small town of Shonkin, the Indian name for the Highwood Mountains. The volcanic rocks are made up of flows with interbedded lenses of ash, breccia, and volcanic sediments. The intrusions occur primarily as dikes and laccoliths, a relatively rare structure. Laccoliths are sill-like intrusive bodies that form when feeder dikes inject molten material between layers of sedimentary rocks. They typically have flat floors and domed roofs, unlike more common types of intrusive bodies.

The Highwood Mountains consist primarily of the eroded remnants of extrusive flows, with a dozen or more shonkinite laccoliths. The central core of the mountains is surrounded by a large dike swarm which radiates away from its center. The rock types consist of mafic (dark colored rocks high in iron and magnesium) and felsic (light colored rocks high in aluminum and shonkinite). The larger shonkinite laccoliths, including the nearby Square and Round Buttes, are capped by light-colored syenite, a silica-deficient, potassium rich rock.

The Bearpaw Mountains consist of two separate, deeply eroded volcanic fields. They are separated by the Bearpaw Arch, a northeast to east-trending band of deformed and metamorphosed sedimentary rocks that is 2 to 8 miles wide. The Bearpaw Mountains consist of the same rock types as are in the Highwood Mountains.

Continental ice sheets covered most of the area several different times since the beginning of the

Pleistocene Epoch, two to three million years ago, and left a thick blanket of glacial till covering the plains. The ice moved in a generally southwestward direction. Glacial till and outwash deposits cover most of the survey area, and glacial erratics occur at elevations above 5,000 feet in the Bearpaw Mountains. The ice sheet does not appear to have extended much beyond the Big Sag and the town of Highwood, or up into the Highwood Mountains.

Geologic Units

The sequence of rocks exposed in the survey area begins with the sedimentary rocks deposited during the Lower Cretaceous Period of the Mesozoic Era. These formations are summarized below, and all are listed in order of decreasing age. Because the rocks are dipping gently to the northeast, formations of decreasing age are exposed in northwest-southeast trending bands.

The classification of rock units based on their lithology is from largest to smallest, group, formation, and member. For example, a formation is subdivided into members. "Systems" are the rocks deposited during a particular geologic period.

Cretaceous system (135 to 65 million years). The Kootenai Formation contains the oldest rocks exposed in the Chouteau County area. They consist of red, green, and gray shale with cross-bedded sandstone and thin limestone beds. They are exposed only in a limited area in the Belt Creek drainage along the southwestern margin of the county. It is used extensively as an artesian aquifer in the southwestern half of the county. The Kootenai Formation is of such small extent that it is not associated with any particular soil series.

The Colorado Group directly overlies the Kootenai Formation, and is approximately 1,800 feet thick in this area. It crops out in a wide band north and northwest of the Highwoods, occupying over 30 percent of the county. It has locally been subdivided into the Blackleaf Formation and the overlying Marias River Formation, but is often referred to as the Colorado Shale. It consists of a dark gray marine shale with minor amounts of sandstone, and contains veins of selenite and bentonite layers. The bentonite is derived from weathered layers of volcanic ash. Due to the high salt content of the shale it is often associated with saline seeps and slick spots. Typical soils derived from this formation include Neldore, Bascovy, Marvan, Vanda, Norbert, and Barkof. These same series are formed on all shale bedrock in the survey area.

The Montana Group directly overlies the Colorado Group. It has been subdivided from bottom to top into the Telegraph Creek, Eagle Sandstone, Claggett Shale,

Judith River, Bearpaw Shale, and Fox Hills Formations. Its total thickness ranges from 1,965 to 2,300 feet.

The Telegraph Creek Formation is non-marine and consists primarily of thin, alternating beds of buff-colored sandstone and gray-blue shale. It is transitional between the underlying Colorado Group and the overlying Eagle Sandstone, and is locally thin or absent. It outcrops in small local exposures west of the town of Virgelle. The Telegraph Creek Formation is of such small extent that it is not associated with any particular soil series.

The Eagle Formation consists of an upper member with alternating beds of sandstone and shale, with minor amounts of coal. The lower, Virgelle Sandstone Member, is a massive buff to white sandstone which is very distinctive in outcrop. It forms the white bluffs above Highway 80, southeast of Geraldine, and the White Cliffs area on the Missouri River. The Virgelle Sandstone is used extensively as a regional aquifer, however the water can be highly mineralized. Typical soils derived from this formation include Fleak, Twilight, Busby, Cohagen, Tally, Vebar, Cabba, Macar, Sagedale, and Wayden.

The Claggett Shale underlies a large portion of the northern part of the survey area, and consists primarily of a brownish-gray marine shale. The surface turns to gumbo when wet, and it contains beds of bentonite up to 2 feet thick. It erodes to badlands topography where exposed. Typical soils derived from this formation include Neldore, Bascovy, and Marvan.

The Judith River Formation is exposed in the northeast corner of the county at the foot of the Bearpaw Mountains. It consists of crossbedded sandstone and gray to buff shale with minor amounts of lignite. It weathers to spectacular badlands where exposed, which include sodic slick spots. Typical soils derived from this formation include Cabbart, Yawdim, Delpoint, Yamacall, Mego not, and Weingart.

Minor amounts of the Bearpaw Shale outcrop in the foothills of the Bearpaw Mountains. It consists of a dark gray marine shale with bentonite beds. It is also associated with saline seeps. Its surface can glisten with gypsum crystals which have weathered out of the matrix, and it is known to contain fossils of marine reptiles. Typical soils derived from this formation include Neldore, Bascovy, Marvan, and Vanda.

The upper member of the Montana Group, the Fox Hills Sandstone, is the transitional unit between the Bearpaw Shale and the Hell Creek Formation. It consists of crossbedded sandstone at the bottom, and grades upward into interbedded sandstone and shale. The lower sandstone unit is used extensively as an

aquifer in many parts of Montana, but is limited in volume in the Chouteau County area. Typical soils derived from this formation include Fleak, Twilight, and Busby.

The Hell Creek Formation is the last formation to have been deposited during the Cretaceous Period. It is composed of alternating beds of shale and sandstone. It contains dinosaur bones, mostly in fragments, and is exposed in small outcrops east of Big Sandy in the foothills of the Bearpaw Mountains. Typical soils derived from this formation include Fleak, Twilight, and Busby.

Tertiary system (65 to 2.5 million years). The Fort Union Formation is the oldest formation in the Tertiary Period of the Cenozoic Era. It is a non-marine formation composed of sandstone and shale which once covered most of eastern Montana in thicknesses of several thousand feet. It has limited exposure in the survey area, outcropping in a few areas at the base of the Bearpaw Mountains. The Bearpaw Mountain volcanics were deposited unconformably upon the erosional surface of the Fort Union and the overlying Wasatch Formations. Typical soils derived from this formation include Cabbart, Delpoint, Yamacall, Yawdim, and Mego not.

The Wasatch Formation is the youngest consolidated sedimentary bedrock in the county, conformably overlying the Fort Union Formation. It consists of non-marine variegated siltstone, sandstone, and bentonitic mudstones. It has limited exposure in the Bearpaw Mountains, outcropping only within the Rocky Boy Reservation. The Wasatch Formation is of such small extent that it is not associated with any particular soil series.

The coarse grained intrusive rocks exposed in the mountains of the Chouteau County area were emplaced during the early Tertiary Period, approximately 50 million years ago. They include a variety of relatively unusual silica deficient rocks including shonkinite, syenite, monzonite, and latite, and occur primarily as dikes and laccoliths. Typical soils derived from these rock types include Ambrant, Elkner, Hedoes, Belain, and Whitlash.

The fine grained extrusive rocks have similar composition to the coarse grained rocks, high in potassium and sodium and low in silica, however they erupted at the surface and are finer textured. Common rock types are trachyte, leucite, phonolite, and latite. Typical soils derived from these rock types include Winkler, Garlet, Perma, and Whitlash.

Unconsolidated Quaternary-aged terrace deposits, formed by streams and slope wash, occur up to 200 feet above present valley levels. They consist of poorly

sorted, limy, bouldery gravels and can be more than 20 feet thick. Typical soils derived from these deposits include Attewan, Tinsley, Turner, Sweetgrass, Tamaneen, and Beaverton.

The present valleys are filled with Quaternary-aged alluvium. They consist of gravel, sand, silt, and clay in maximum thicknesses of 25 feet, in smaller drainages and undrained depressions. The Missouri River alluvium is much thicker, with a maximum thickness of 150 feet, and consist of stratified clay, silt, and sand with a few lenses of gravel. Typical soils formed from these deposits include Bigsandy, Havre, Glendive, Rivra, Straw, Nesda, and Mcllwaine.

Glacial till, glaciofluvial deposits, and glaciolacustrine deposits cover the surface of much of the survey area. The till consists of unstratified, highly consolidated, gray clay with inclusions of sand, gravel, and boulders up to 12 feet in diameter. It is made up of finely ground sedimentary rocks which were scraped up and incorporated in the ice as the glacier advanced, and includes erratics from as far away as the Canadian Shield in northeastern Canada. Till averages 5 to 30 feet in thickness, with a maximum thickness of 300 feet. There is commonly a 3 to 15 foot thick gravel zone between the till and the underlying bedrock. Typical soils derived from glacial till include Telstad, Joplin, Scobey, Kevin, Hillon, Bearpaw, Vida, and Zahill. The glaciofluvial deposits consist of mixtures of materials moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. These deposits are often intricately associated with the glacial till. Typical soils derived from glaciofluvial deposits are Chinook, Degrand, Ethridge, Evanston, Farnuf, Fortbenton, Kremlin, Lonna, and Savage. The glaciolacustrine deposits are silts and clays derived from glaciers and deposited in glacial lakes by water originating mainly from the melting of glacial ice. Many deposits are bedded or laminated with varves. Extensive areas of glaciolacustrine deposits are in the southwestern part of the survey area from Glacial Lake Great Falls. Typical soils are Acel, Kobase, Lambeth, Linnet, Lonna, Marias, and Pendroy.

Special Geologic Features

Glacial activity in the survey area has created several unusual erosional features and some spectacular scenery. Temporary meltwater channels from Glacial Lake Great Falls have eroded large valleys including the Big Sag, northeast of Highwood, and the Shonkin Sag. Shonkin Sag, on the north side of the Highwood Mountains, was eroded by water from Glacial Lake Great Falls while the ice front stood near the base of the Highwoods.

A cross section of the Shonkin laccolith is visible above the Shonkin Sag, and the interfingering igneous and sedimentary rocks are clearly exposed (fig. 2).

The Lost Lake laccolith was exposed by erosion of a retreating waterfall of glacial meltwater. Lost Lake now sits below vertical cliffs of shonkinite 100 feet high, and its interfingering sediments and shonkinite are also very well exposed. The shonkinite outcropping at the surface above Lost Lake has weathered along the horizontal joint system to form hoodoos, which are sculpted erosional remnants resembling well rounded columns.

More spectacular geology is exposed in the Missouri River channel below Virgelle. At the White Cliffs Area, near Eagle Creek, the river has eroded through the white Virgelle Sandstone leaving 180 foot high cliffs. The surface of the Virgelle has also eroded to form hoodoos, and more resistant iron concretions within the formation can be seen sticking out of the face.

Climate

The Chouteau County Area generally has pleasant summers with cool nights, warm and sunny days, and little weather that is very hot or humid. Most summer rainfall occurs as showers and thunderstorms, but steady rains may occur during late spring and early summer. Early spring and fall have periods of strong winds that last for several days at a time. Only 2 years in 10 will have temperatures exceeding 100 degrees F. in July or August. Most precipitation falls during the warm period from April to September and is heaviest in May to August.

Winters are not as cold as usually expected of continental locations at this latitude, largely as result of the "chinook" winds for which the area is noted. While sub-zero weather is experienced several times during the winter, the coldest temperatures seldom last more than a week or two at a time. Frequent southwest "chinook" winds can produce sharp temperature rises of 40 degrees F. or more in a few hours. As a result of recurring "chinooks," snow seldom accumulates to any great depth. The ground is usually bare or nearly bare most of the winter except in the mountains and foothills. Invasions of cold arctic air from the north occur several times each winter, with sharp temperature drops and heavy snowfall.

The Temperature and Precipitation table gives data on temperature and precipitation in the survey area as recorded at Big Sandy, Fort Benton, Geraldine, Iliad, Loma, and Shonkin. The Freeze Dates in Spring and Fall table shows probable dates of the first freeze in fall



Figure 2. Nearly vertical cliffs of shonkinite rock at Lost Lake.

and the last freeze in spring. The Growing Season table provides data on length of the growing season.

As is usual in areas having large variations in elevation and irregular topographic features, differences in the amount and time of precipitation are considerable. Generally, precipitation falls as snow during late fall, winter, and early spring. Late spring, summer, and early fall precipitation is almost always rain, but hail occurs frequently during summer thunderstorms. The wettest areas are in the foothills and mountains.

Although the plains areas' average annual precipitation would normally classify as semi-arid, it is

important to note that about 70 percent of the annual total precipitation falls during the April to September growing season. The combination of ideal temperatures during the peak of the growing season, long hours of summer sunshine, and nearly 10 inches of precipitation during the 6 critical months makes the climate very favorable for dryland farming. Heavy fog seldom occurs, incidence usually being limited to about one day per month, but each case lasts only a small part of the day. Although the average windspeed is relatively high, extremely strong winds of over 50 mph seldom are observed and visibility normally is excellent.

Temperature and Precipitation

(Recorded in the period 1961-90 at Big Sandy; Fort Benton; Geraldine; Iliad; Loma; and Shonkin)

Month	Temperature (Degrees F.)						Precipitation (Inches)				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have max. temp more than	2 years in 10 will have min. temp less than	Average number of growing degree days*	Average	2 years in 10 will have Less than	2 years in 10 will have More than	Average number of days with 0.10 or more snow fall	Average total
BIG SANDY:											
January----	27.9	4.6	16.3	57	-35	7	0.63	0.29	0.97	2	7.2
February--	36.1	11.4	23.7	63	-25	13	0.40	0.17	0.60	1	3.0
March-----	46.0	20.7	33.3	72	-16	57	0.55	0.19	0.85	2	3.7
April-----	59.8	31.1	45.5	85	7	213	1.06	0.37	1.70	2	1.7
May-----	70.6	41.1	55.8	92	25	492	2.65	1.06	4.00	5	0.2
June-----	79.7	49.1	64.4	98	34	730	2.39	1.22	3.41	5	0.0
July-----	87.8	53.1	70.4	101	39	939	1.49	0.53	2.28	3	0.0
August-----	86.8	51.5	69.1	104	36	893	1.44	0.48	2.32	3	0.0
September-	73.9	41.0	57.5	96	23	526	1.53	0.53	2.35	3	0.1
October---	62.9	31.6	47.3	86	6	269	0.75	0.30	1.13	2	0.9
November--	43.5	18.4	31.0	70	-17	41	0.49	0.16	0.78	1	3.8
December--	31.5	7.9	19.7	60	-33	7	0.48	0.20	0.75	1	2.6
Yearly:											
Average--	58.9	30.1	44.5	---	---	---	---	---	---	---	---
Extreme--	111	-51	---	105	-39	---	---	---	---	---	---
Total----	---	---	---	---	---	4,188	13.86	9.30	16.84	30	23.1
FT. BENTON:											
January---	32.3	8.6	20.5	64	-32	22	0.71	0.24	1.13	2	15.3
February--	39.9	14.3	27.1	69	-23	30	0.46	0.20	0.69	1	9.5
March-----	48.2	21.6	34.9	75	-15	68	0.91	0.40	1.34	2	9.7
April-----	60.3	31.2	45.8	86	9	214	1.21	0.42	1.86	3	5.5
May-----	69.9	40.8	55.4	92	24	478	2.51	1.31	3.57	5	0.5
June-----	78.7	48.5	63.6	98	34	707	2.51	1.09	3.73	5	0.0
July-----	86.1	52.3	69.2	101	39	906	1.29	0.42	2.01	3	0.0
August-----	84.7	50.9	67.8	102	35	861	1.45	0.33	2.32	3	0.0
September-	73.1	40.7	56.9	95	23	510	1.29	0.41	2.01	3	0.3
October---	63.3	32.0	47.6	87	8	269	0.80	0.25	1.24	2	1.7
November--	46.2	20.2	33.2	74	-14	62	0.58	0.19	0.90	2	8.5
December--	34.6	11.1	22.9	65	-32	24	0.67	0.27	1.01	2	13.5
Yearly:											
Average--	59.8	31.0	45.4	---	---	---	---	---	---	---	---
Extreme--	109	-49	---	103	-37	---	---	---	---	---	---
Total----	---	---	---	---	---	4,150	14.39	11.39	17.23	33	64.4
GERALDINE:											
January---	33.1	9.1	21.1	64	-29	27	0.80	0.38	1.21	2	12.9
February--	39.6	15.0	27.3	67	-21	31	0.49	0.22	0.72	2	7.3
March-----	46.2	21.6	33.9	73	-16	63	0.80	0.32	1.20	2	9.2
April-----	57.8	30.5	44.2	83	7	179	1.17	0.61	1.67	3	6.6
May-----	67.6	40.1	53.8	89	22	430	3.17	1.70	4.47	6	1.7
June-----	76.7	47.9	62.3	97	33	666	2.52	1.35	3.56	5	0.1
July-----	85.3	51.9	68.6	100	38	886	1.54	0.68	2.28	3	0.0
August-----	84.4	50.7	67.6	102	35	855	1.61	0.48	2.53	3	0.0
September-	72.3	41.2	56.8	95	22	507	1.41	0.47	2.18	3	0.6

* See footnote at end of table.

Temperature and Precipitation--Continued

(Recorded in the period 1961-90 at Big Sandy; Fort Benton; Geraldine; Iliad; Loma; and Shonkin)

Month	Temperature (Degrees F.)						Precipitation (Inches)				
	Average	Average	Average	2 years in 10		Average	2 years in 10		Average	Average	
	daily	daily		will have	max. min.	number	Average	will have	of days		
maximum	minimum	temp	temp	of	Less	More	with	total			
		more	less	degree	than	than	0.10 or	fall			
		than	than	days*			more				
GERALDINE (cont.)											
October---	62.1	32.9	47.5	85	7	270	0.85	0.26	1.33	2	2.6
November--	45.5	20.7	33.1	73	-14	62	0.58	0.20	0.90	2	7.5
December--	35.4	11.5	23.4	65	-31	25	0.71	0.25	1.08	2	11.7
Yearly:											
Average--	58.8	31.1	45.0	---	---	---	---	---	---	---	---
Extreme--	108	-42	---	103	-34	---	---	---	---	---	---
Total----	---	---	---	---	---	4,001	15.65	12.75	17.91	35	60.2
ILIAD:											
January---	29.5	5.8	17.6	61	-34	9	0.50	0.24	0.94	2	5.1
February--	36.4	12.3	24.4	65	-23	13	0.40	0.24	0.63	1	3.6
March-----	46.2	20.8	33.5	72	-15	47	0.59	0.25	0.88	1	1.7
April-----	59.7	30.7	45.2	85	9	192	0.99	0.48	1.49	3	1.6
May-----	69.4	39.9	54.6	92	25	443	2.38	1.20	3.42	5	0.4
June-----	78.5	47.5	63.0	98	32	648	2.10	1.23	2.87	5	0.0
July-----	87.0	51.8	69.4	102	38	853	1.33	0.68	1.98	3	0.0
August----	85.6	49.9	67.7	103	35	838	1.50	0.53	2.50	3	0.0
September-	73.3	39.5	56.4	97	21	479	1.12	0.39	1.86	3	0.0
October---	62.4	30.4	46.4	87	6	234	0.66	0.23	1.05	2	0.5
November--	44.0	17.8	30.9	72	-17	39	0.40	0.22	0.70	1	1.0
December--	31.2	7.2	19.2	62	-34	8	0.34	0.19	0.65	1	1.8
Yearly:											
Average--	58.6	29.5	44.0	---	---	---	---	---	---	---	---
Extreme--	112	-48	---	104	-38	---	---	---	---	---	---
Total----	---	---	---	---	---	3,802	12.29	8.37	14.03	30	15.6
LOMA:											
January---	30.7	4.4	17.6	63	-39	12	0.72	0.29	1.12	2	12.9
February--	38.9	11.2	25.1	68	-27	20	0.45	0.16	0.69	1	8.1
March-----	47.8	20.5	34.1	75	-18	58	0.82	0.31	1.24	2	7.0
April-----	60.4	30.5	45.4	87	7	206	1.07	0.43	1.74	3	4.3
May-----	70.9	40.4	55.7	95	24	482	2.32	1.19	3.30	5	0.8
June-----	80.1	48.7	64.4	101	34	723	2.32	1.14	3.35	5	0.0
July-----	88.6	52.9	70.8	104	40	945	1.22	0.52	1.81	3	0.0
August----	86.8	50.7	68.8	105	36	884	1.47	0.55	2.42	3	0.0
September-	74.6	40.8	57.7	99	24	533	1.20	0.32	1.90	3	0.5
October---	63.7	30.9	47.3	88	7	261	0.70	0.27	1.06	2	1.2
November--	46.1	18.3	32.2	74	-17	52	0.53	0.20	0.83	2	6.7
December--	33.9	7.4	20.6	64	-39	15	0.60	0.22	0.92	2	10.7
Yearly:											
Average--	60.2	29.7	45.0	---	---	---	---	---	---	---	---
Extreme--	111	-54	---	107	-45	---	---	---	---	---	---
Total----	---	---	---	---	---	4,190	13.40	10.20	16.11	33	52.3

* See footnote at end of table.

Temperature and Precipitation--Continued

(Recorded in the period 1961-90 at Big Sandy; Fort Benton; Geraldine; Iliad; Loma; and Shonkin)

Month	Temperature (Degrees F.)						Precipitation (Inches)				
	Average	Average	Average	2 years in 10		Average	Average	2 years in 10		Average	Average
	daily	daily		max.	min.	of		Less	More	of days	
maximum	minimum	temp	temp	growing	than	than	0.10 or	more	fall		
SHONKIN:											
January---	33.2	11.9	22.6	60	-27	22	1.50	0.68	2.21	5	23.0
February--	38.5	17.3	27.9	62	-19	24	1.12	0.67	1.52	3	14.9
March-----	43.4	22.1	32.8	69	-13	47	2.06	1.10	2.90	5	23.7
April-----	52.7	30.1	41.4	78	6	136	2.70	1.40	3.83	6	18.4
May-----	62.3	38.4	50.4	85	21	330	5.35	2.77	7.61	7	7.0
June-----	71.1	45.0	58.0	90	31	537	4.33	1.95	6.37	7	0.0
July-----	79.8	49.4	64.6	95	37	748	1.91	0.76	2.89	4	0.0
August-----	79.5	48.3	63.9	96	35	726	2.21	0.72	3.43	3	0.0
September--	67.2	40.6	53.9	91	21	424	2.93	1.18	4.59	5	2.3
October---	58.0	34.1	46.0	81	8	237	1.85	0.92	2.77	4	8.8
November--	43.0	22.8	32.9	68	-12	57	1.30	0.57	1.91	4	15.0
December--	35.5	15.7	25.6	60	-28	26	1.49	0.72	2.15	4	22.3
Yearly:											
Average--	55.3	31.3	43.3	---	---	---	---	---	---	---	---
Extreme--	104	-42	---	98	-32	---	---	---	---	---	---
Total----	---	---	---	---	---	3,313	28.75	22.41	34.38	57	135.5

*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)

Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Big Sandy; Fort Benton; Geraldine; Iliad; Loma; and Shonkin)

Probability	Temperature		
	24 degrees F or lower	28 degrees F or lower	32 degrees F or lower
BIG SANDY:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 5	May 23	June 6
2 years in 10 later than---	May 1	May 17	May 31
5 years in 10 later than---	April 22	May 6	May 20
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 19	Sept. 10	Sept. 4
2 years in 10 earlier than-	Sept. 25	Sept. 16	Sept. 8
5 years in 10 earlier than-	Oct. 6	Sept. 26	Sept. 16
FORT BENTON:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 5	May 20	June 3
2 years in 10 later than---	May 1	May 15	May 30
5 years in 10 later than---	April 22	May 5	May 21
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 19	Sept. 6	Sept. 3
2 years in 10 earlier than-	Sept. 25	Sept. 12	Sept. 7
5 years in 10 earlier than-	Oct. 5	Sept. 24	Sept. 14
GERALDINE:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 13	May 22	June 11
2 years in 10 later than---	May 8	May 17	June 5
5 years in 10 later than---	April 27	May 8	May 24

Freeze Dates in Spring and Fall--Continued

(Recorded in the period 1961-90 at Big Sandy; Fort Benton; Geraldine; Iliad; Loma; and Shonkin)

Probability	Temperature		
	24 degrees F or lower	28 degrees F or lower	32 degrees F or lower
GERALDINE (cont.)			
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 14	Sept. 5	Sept. 3
2 years in 10 earlier than-	Sept. 20	Sept. 11	Sept. 8
5 years in 10 earlier than-	Oct. 2	Sept. 23	Sept. 16
ILIAD:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 14	May 27	June 8
2 years in 10 later than---	May 7	May 20	May 31
5 years in 10 later than---	April 24	May 6	May 17
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 14	Sept. 7	Sept. 2
2 years in 10 earlier than-	Sept. 20	Sept. 12	Sept. 6
5 years in 10 earlier than-	Oct. 2	Sept. 22	Sept. 16
LOMA:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 5	May 19	June 1
2 years in 10 later than---	May 1	May 14	May 27
5 years in 10 later than---	April 22	May 5	May 17
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 19	Sept. 13	Sept. 2
2 years in 10 earlier than-	Sept. 25	Sept. 18	Sept. 6
5 years in 10 earlier than-	Oct. 5	Sept. 27	Sept. 14

Freeze Dates in Spring and Fall--Continued

(Recorded in the period 1961-90 at Big Sandy; Fort Benton; Geraldine; Iliad; Loma; and Shonkin)

Probability	Temperature		
	24 degrees F or lower	28 degrees F or lower	32 degrees F or lower
SHONKIN:			
Last freezing temperature in spring: January-July			
1 year in 10 later than----	May 12	May 26	June 20
2 years in 10 later than---	May 5	May 20	June 13
5 years in 10 later than---	April 23	May 9	May 29
First freezing temperature in fall: August-Dec.			
1 year in 10 earlier than--	Sept. 17	Sept. 11	Sept. 2
2 years in 10 earlier than-	Sept. 24	Sept. 17	Sept. 7
5 years in 10 earlier than-	Oct. 7	Sept. 28	Sept. 17

Growing Season

(Recorded in the period 1961-90 at Big Sandy; Fort Benton; Geraldine; Iliad; Loma; and Shonkin)

Probability	Daily Minimum Temperature		
	Higher than 24 degrees F	Higher than 28 degrees F	Higher than 32 degrees F
	Days	Days	Days
BIG SANDY:			
9 years in 10-----	142	122	96
8 years in 10-----	150	129	104
5 years in 10-----	165	142	118
2 years in 10-----	181	155	133
1 year in 10-----	189	162	140
FORT BENTON:			
9 years in 10-----	145	117	96
8 years in 10-----	152	125	103
5 years in 10-----	164	141	116
2 years in 10-----	177	156	129
1 year in 10-----	183	164	135
GERALDINE:			
9 years in 10-----	137	116	90
8 years in 10-----	145	123	98
5 years in 10-----	159	137	114
2 years in 10-----	173	151	129
1 year in 10-----	180	159	137
ILLIAD:			
9 years in 10-----	134	115	95
8 years in 10-----	143	124	104
5 years in 10-----	160	140	122
2 years in 10-----	177	157	140
1 year in 10-----	185	166	149

Growing Season--Continued

(Recorded in the period 1961-90 at Big Sandy; Fort Benton; Geraldine;
Iliad; Loma; and Shonkin)

Probability	Daily Minimum Temperature		
	Higher than 24 degrees F	Higher than 28 degrees F	Higher than 32 degrees F
	Days	Days	Days
LOMA:			
9 years in 10-----	141	126	98
8 years in 10-----	149	132	105
5 years in 10-----	165	145	120
2 years in 10-----	181	157	134
1 year in 10-----	189	164	141
SHONKIN:			
9 years in 10-----	134	119	85
8 years in 10-----	145	127	94
5 years in 10-----	166	141	111
2 years in 10-----	187	155	128
1 year in 10-----	198	163	137

Formation and Classification of the Soils

Formation of the Soils

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

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

Within short distances the combination of these factors varies, and consequently the soils that form differ in fertility, productivity, and physical and chemical characteristics.

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification.

Climate

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

Precipitation and temperature affect the kind and amount of vegetation that grows on the soil. Vegetation decays to produce organic matter in the soil. Soils that have cool temperatures and high precipitation generally contain more organic matter and are dark colored. Soils with warm temperatures and low precipitation generally contain less organic matter and are light colored.

The average annual precipitation ranges from about

11 to 17 inches on the till plains and sedimentary plains, and from 15 to 28 inches in the foothills and mountains. The average annual temperature ranges from 38 to 45 degrees F.

Living Organisms

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

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

The vegetation in the survey area is mainly short grasses, mid grasses, and shrubs on the plains; with mid grasses, shrubs, coniferous, and deciduous trees in the foothills and mountains.

Topography

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

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

in this survey area. Examples of this general principle are the Hillon soils that are moderately steep to very steep and the Telstad soils that are nearly level to gently rolling.

Parent Material

Many of the soils in this survey formed in glacial till or in glaciofluvial deposits. Some of the soils formed in alluvium derived from mixed sources, and other soils formed in material weathered from shale, sandstone, or igneous rocks.

The soils that formed in glacial till, such as the Telstad and Joplin series, are loamy, while the Scobey and Bearpaw series are clayey. Soils that formed in sandstone or interbedded sandstone and shale, such as the Cabba and Reeder series, are loamy. Soils that formed in shale, such as the Neldore and Bascovy series, are clayey. The soils that formed in mixed alluvium, such as the Hanly, Havre, and Harlake series may be sandy, loamy, or clayey.

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

Time

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

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

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

The Evanston series, of the Mollisol order, formed in parent material that is similar to that of the Havre series but is much older. The Evanston soils formed in alluvium or glaciofluvial deposits on alluvial fans, stream terraces, and small drainageways. They contain enough organic matter to have a dark colored A horizon, have a distinct clay accumulation in the subsoil or Bt horizon, and nearly all of the carbonates have been leached to a depth of about 14 inches.

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

Classification of the Soils

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

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

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 Aquent (*Aqu*, meaning water, plus *alf*, from Alfisol).

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 Albaqualfs (*Alb*, meaning white, plus *aqualf*, the suborder of the Alfisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typical subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the

great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Albaqualfs.

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, montmorillonitic, frigid Typic Albaqualfs.

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. An example is the Nishon series, which is a fine, montmorillonitic, frigid Typic Albaqualfs.

Classification of the Soils

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

Soil name	Family or higher taxonomic class
Absarokee-----	Fine, montmorillonitic Typic Argiborolls
Absher-----	Fine, montmorillonitic Typic Natriboralfs
Acel-----	Fine, montmorillonitic Mollic Eutroboralfs
Ambrant-----	Coarse-loamy, mixed, frigid Typic Ustochrepts
Amor-----	Fine-loamy, mixed Typic Haploborolls
Arrowpeak-----	Loamy-skeletal, mixed Lithic Cryoborolls
Assiniboine-----	Fine-loamy, mixed Aridic Argiborolls
Attewan-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Barkof-----	Fine, montmorillonitic, frigid Leptic Udic Haplusterts
Bascovy-----	Fine, montmorillonitic, frigid Leptic Udic Haplusterts
Bearpaw-----	Fine, montmorillonitic Typic Argiborolls
Beaverton-----	Loamy-skeletal over sandy or sandy-skeletal, mixed Typic Argiborolls
Belain-----	Coarse-loamy, mixed Typic Haploborolls
Benz-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Bigsag-----	Fine, montmorillonitic (calcareous), frigid Typic Halaquepts
Bigsandy-----	Fine-loamy, mixed (calcareous), frigid Typic Fluvaquents
Busby-----	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Cabba-----	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart-----	Loamy, mixed (calcareous), frigid, shallow Aridic Ustorthents
Chinook-----	Coarse-loamy, mixed Aridic Haploborolls
Cohagen-----	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cozberg-----	Coarse-loamy, mixed Aridic Haploborolls
Creed-----	Fine, montmorillonitic Typic Natriboralfs
Crow-----	Fine, mixed Glossic Eutroboralfs
Daglum-----	Fine, montmorillonitic Vertic Natriborolls
Degradand-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Delpoint-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Eaglecreek-----	Fine-loamy, mixed Mollic Eutroboralfs
Eagleton-----	Fine-loamy, mixed, frigid Cumulic Endoaquolls
Elkner-----	Coarse-loamy, mixed Typic Cryochrepts
Elloam-----	Fine, montmorillonitic Typic Natriboralfs
Elve-----	Loamy-skeletal, mixed Typic Cryochrepts
Enbar-----	Fine-loamy, mixed Cumulic Haploborolls
Ethridge-----	Fine, montmorillonitic Aridic Argiborolls
Evanston-----	Fine-loamy, mixed Aridic Argiborolls
Farnuf-----	Fine-loamy, mixed Typic Argiborolls
Ferd-----	Fine, montmorillonitic Glossic Eutroboralfs
Flatcreek-----	Fine, montmorillonitic (calcareous), frigid Vertic Ustifluvents
Fleak-----	Mixed, frigid, shallow Aridic Ustipsamments
Fortbenton-----	Fine-loamy, mixed Aridic Haploborolls
Garlet-----	Loamy-skeletal, mixed Typic Cryochrepts
Gerber-----	Fine, montmorillonitic Vertic Argiborolls
Gerdrum-----	Fine, montmorillonitic Typic Natriboralfs
Glendive-----	Coarse-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hanly-----	Sandy, mixed, frigid Aridic Ustifluvents
Harlake-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents
Havre-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustifluvents
Hedoes-----	Coarse-loamy, mixed Pachic Haploborolls
Hillon-----	Fine-loamy, mixed (calcareous), frigid Aridic Ustorthents
Joplin-----	Fine-loamy, mixed Aridic Argiborolls
Kenilworth-----	Fine-loamy, mixed Aridic Argiborolls
Kevin-----	Fine-loamy, mixed Aridic Argiborolls
Klayent-----	Fine, mixed (calcareous), frigid Fluvaquentic Endoaquolls
Kobase-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Kremlin-----	Fine-loamy, mixed Aridic Haploborolls
Lacey creek-----	Fine-loamy, mixed Pachic Udic Argiborolls
Lambeth-----	Fine-silty, mixed (calcareous), frigid Aridic Ustorthents
*Lardell-----	Fine-loamy, mixed, frigid Aquollic Salorthids
Libeg-----	Loamy-skeletal, mixed Argic Cryoborolls
Lihen-----	Sandy, mixed Entic Haploborolls

Classification of the Soils--Continued

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

Soil name	Family or higher taxonomic class
Linnet-----	Fine, montmorillonitic Ustertic Argiborolls
Linwell-----	Fine, montmorillonitic Typic Haploborolls
Lonesome-----	Sandy over loamy, mixed (calcareous), frigid Aridic Ustorthents
Lonna-----	Fine-silty, mixed, frigid Aridic Ustochrepts
Lubrecht-----	Fine, mixed Glossic Eutroboralfs
Macar-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Marcott-----	Fine, mixed Aquic Haploborolls
Marias-----	Fine, montmorillonitic, frigid Chromic Udic Haplusterts
Marmarth-----	Fine-loamy, mixed Aridic Argiborolls
Martinsdale-----	Fine-loamy, mixed Typic Argiborolls
Marvan-----	Fine, montmorillonitic, frigid Sodic Haplusterts
McIlwaine-----	Coarse-loamy over sandy or sandy-skeletal, mixed Cumulic Haploborolls
Megonot-----	Fine, montmorillonitic, frigid Aridic Ustochrepts
Neldore-----	Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents
Nesda-----	Sandy-skeletal, mixed Fluventic Haploborolls
Nishon-----	Fine, montmorillonitic, frigid Typic Albaqualfs
Nobe-----	Fine, montmorillonitic (calcareous), frigid Oxyaquic Ustorthents
Norbert-----	Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents
Pendroy-----	Very-Fine, montmorillonitic, frigid Chromic Udic Haplusterts
Perma-----	Loamy-skeletal, mixed Typic Haploborolls
Phillips-----	Fine, montmorillonitic Typic Eutroboralfs
Reeder-----	Fine-loamy, mixed Typic Argiborolls
Rivra-----	Sandy-skeletal, mixed, frigid Aridic Ustifluvents
Roy-----	Clayey-skeletal, mixed Typic Argiborolls
Sagedale-----	Fine, montmorillonitic, frigid Typic Ustochrepts
Savage-----	Fine, montmorillonitic Typic Argiborolls
Scobey-----	Fine, montmorillonitic Aridic Argiborolls
Shambo-----	Fine-loamy, mixed Typic Haploborolls
Shane-----	Fine, montmorillonitic Abruptic Argiborolls
Straw-----	Fine-loamy, mixed Cumulic Haploborolls
Sunburst-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Sweetgrass-----	Clayey over sandy or sandy-skeletal, montmorillonitic Typic Argiborolls
Tally-----	Coarse-loamy, mixed Typic Haploborolls
Tamaneen-----	Fine, montmorillonitic Typic Argiborolls
Tanna-----	Fine, montmorillonitic Aridic Argiborolls
Telstad-----	Fine-loamy, mixed Aridic Argiborolls
Thoeny-----	Fine, montmorillonitic Typic Natriboralfs
Tinsley-----	Sandy-skeletal, mixed, frigid Typic Ustorthents
Toston-----	Fine-loamy, mixed, frigid Typic Natriboralfs
Turner-----	Fine-loamy over sandy or sandy-skeletal, mixed Typic Argiborolls
Twilight-----	Coarse-loamy, mixed, frigid Aridic Ustochrepts
Vanda-----	Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents
Vebar-----	Coarse-loamy, mixed Typic Haploborolls
Vida-----	Fine-loamy, mixed Typic Argiborolls
Waltham-----	Fine, montmorillonitic Typic Natriboralfs
Warwood-----	Fine-loamy, mixed Glossic Cryoboralfs
Wayden-----	Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents
Weingart-----	Fine, montmorillonitic Typic Natriboralfs
Whitlash-----	Loamy-skeletal, mixed Lithic Haploborolls
Williams-----	Fine-loamy, mixed Typic Argiborolls
Winifred-----	Fine, montmorillonitic Typic Haploborolls
Winkler-----	Loamy-skeletal, mixed, frigid Typic Ustochrepts
Work-----	Fine, montmorillonitic Typic Argiborolls
Yamacall-----	Fine-loamy, mixed, frigid Aridic Ustochrepts
Yawdim-----	Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents
Yetull-----	Mixed, frigid Typic Ustipsamments
Zahill-----	Fine-loamy, mixed (calcareous), frigid Typic Ustorthents

* Taxadjunct

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
2	Riverwash-----	2,120	*
2B	Marcott-Bigsandy complex, 0 to 4 percent slopes-----	4,085	0.2
12C	Beaverton complex, 2 to 8 percent slopes-----	1,506	*
13C	Tanna clay loam, 2 to 8 percent slopes-----	916	*
15E	Lambeth silt loam, 8 to 25 percent slopes-----	7,275	0.3
15F	Lambeth silt loam, 25 to 70 percent slopes-----	21,025	0.8
16B	Degradand loam, 0 to 4 percent slopes-----	1,869	*
17B	Delpoint loam, 0 to 4 percent slopes-----	1,347	*
21E	Cabbart-Delpoint loams, 8 to 25 percent slopes-----	3,771	0.1
22F	Hillon loam, 25 to 60 percent slopes-----	44,024	1.7
27B	Attewan loam, 0 to 4 percent slopes-----	3,457	0.1
28	Nishon clay loam, 0 to 1 percent slopes-----	14,650	0.6
30B	Marvan clay, 0 to 4 percent slopes-----	22,124	0.9
30C	Marvan clay, 4 to 8 percent slopes-----	4,545	0.2
31A	Ferd loam, 0 to 2 percent slopes-----	2,632	0.1
32B	Kobase silty clay loam, 0 to 4 percent slopes-----	16,978	0.7
32C	Kobase silty clay loam, 4 to 8 percent slopes-----	7,196	0.3
32D	Kobase silty clay loam, 8 to 15 percent slopes-----	1,376	*
33A	Phillips loam, 0 to 2 percent slopes-----	13,354	0.5
34A	Linnet silty clay, 0 to 2 percent slopes-----	3,802	0.2
35B	Assinniboine fine sandy loam, 0 to 4 percent slopes-----	5,710	0.2
36B	Chinook fine sandy loam, 0 to 4 percent slopes-----	9,341	0.4
36C	Chinook fine sandy loam, 4 to 8 percent slopes-----	3,128	0.1
37B	Evanston loam, 0 to 4 percent slopes-----	60,419	2.4
37C	Evanston loam, 4 to 8 percent slopes-----	7,443	0.3
38B	Ethridge silty clay loam, 0 to 4 percent slopes-----	52,128	2.1
39B	Assinniboine loam, 0 to 4 percent slopes-----	1,822	*
43A	Pendroy clay, 0 to 2 percent slopes-----	5,139	0.2
44B	Kevin clay loam, 0 to 4 percent slopes-----	3,631	0.1
47B	Marias silty clay, 0 to 4 percent slopes-----	22,638	0.9
47C	Marias silty clay, 4 to 8 percent slopes-----	1,078	*
48A	Vanda clay, 0 to 2 percent slopes-----	1,561	*
48C	Vanda clay, 2 to 8 percent slopes-----	1,120	*
50A	Telstad loam, 0 to 2 percent slopes-----	45,985	1.8
55B	Lihen loamy fine sand, 0 to 6 percent slopes-----	2,645	0.1
56A	Scobey clay loam, 0 to 2 percent slopes-----	14,782	0.6
57B	Absarokee clay loam, 0 to 4 percent slopes-----	1,262	*
57C	Absarokee clay loam, 4 to 8 percent slopes-----	660	*
57E	Absarokee-Reeder complex, 8 to 25 percent slopes-----	2,844	0.1
58B	Lonna silty clay loam, 0 to 4 percent slopes-----	6,652	0.3
58C	Lonna silty clay loam, 4 to 8 percent slopes-----	3,668	0.1
60A	Havre loam, 0 to 2 percent slopes-----	8,516	0.3
63	Lardell silty clay, 0 to 1 percent slopes-----	1,180	*
67B	Bearpaw clay loam, 0 to 4 percent slopes-----	38,955	1.5
67C	Bearpaw clay loam, 4 to 8 percent slopes-----	1,701	*
68B	Gerber silty clay, 0 to 4 percent slopes-----	9,253	0.4
69C	Vida-Zahill clay loams, 2 to 8 percent slopes-----	5,924	0.2
71D	Roy very cobbly clay loam, 2 to 15 percent slopes-----	1,081	*
72F	Zahill clay loam, 25 to 60 percent slopes-----	23,758	0.9
73B	Yetull-Lonesome loamy fine sands, 0 to 6 percent slopes-----	2,085	*
74C	Shambo loam, 2 to 8 percent slopes-----	1,956	*
75B	Farnuf loam, 0 to 4 percent slopes-----	6,952	0.3
75C	Farnuf loam, 4 to 8 percent slopes-----	5,640	0.2
76C	Hedoes loam, 2 to 8 percent slopes-----	3,079	0.1
77F	Tinsley gravelly sandy loam, 15 to 45 percent slopes-----	1,881	*
79B	Yamacall loam, 0 to 4 percent slopes-----	5,563	0.2
79C	Yamacall loam, 4 to 8 percent slopes-----	10,074	0.4
79D	Yamacall loam, 8 to 15 percent slopes-----	4,556	0.2
81A	Glendive sandy loam, 0 to 2 percent slopes-----	1,479	*
82B	Savage silty clay loam, 0 to 4 percent slopes-----	12,706	0.5
86B	Work clay loam, 0 to 4 percent slopes-----	2,799	0.1

* See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
86C	Work clay loam, 4 to 8 percent slopes-----	7,288	0.3
86D	Work clay loam, 8 to 15 percent slopes-----	1,928	*
87B	Tamaneen clay loam, 0 to 4 percent slopes-----	3,010	0.1
88C	Perma gravelly loam, 2 to 8 percent slopes-----	503	*
90A	Harlake silty clay, 0 to 1 percent slopes-----	2,176	*
92E	Sunburst-Bascovy complex, 8 to 25 percent slopes-----	1,123	*
93F	Yetull fine sandy loam, 15 to 45 percent slopes-----	4,229	0.2
94B	Busby fine sandy loam, 0 to 4 percent slopes-----	1,238	*
94C	Busby fine sandy loam, 4 to 8 percent slopes-----	3,064	0.1
94D	Busby fine sandy loam, 8 to 15 percent slopes-----	1,605	*
96B	Macar loam, 0 to 4 percent slopes-----	1,971	*
96C	Macar loam, 4 to 8 percent slopes-----	2,642	0.1
98B	Kremlin loam, 0 to 4 percent slopes-----	11,063	0.4
98C	Kremlin loam, 4 to 8 percent slopes-----	2,022	*
99	Rivra-Harly complex, 0 to 2 percent slopes-----	2,887	0.1
110C	Laceycreek loam, 2 to 8 percent slopes-----	1,085	*
110D	Laceycreek loam, 8 to 15 percent slopes-----	937	*
110E	Laceycreek loam, 15 to 25 percent slopes-----	893	*
130A	Nesda-McIlwaine complex, 0 to 2 percent slopes-----	3,381	0.1
140A	Klayent clay loam, 0 to 1 percent slopes-----	1,096	*
141B	Megonot-Weingart-Delpoint complex, 0 to 4 percent slopes-----	1,670	*
142C	Megonot-Kobase-Delpoint complex, 2 to 8 percent slopes-----	2,543	0.1
160A	Bigsandy loam, 0 to 1 percent slopes-----	2,828	0.1
171C	Delpoint-Cabbart loams, 2 to 8 percent slopes-----	957	*
180A	McIlwaine-Nesda-Straw complex, 0 to 2 percent slopes-----	1,732	*
182F	Megonot-Yawdim silty clay loams, 25 to 60 percent slopes-----	5,050	0.2
200	Badland-----	22,661	0.9
201F	Cabba-Wayden-Rock outcrop complex, 25 to 70 percent slopes-----	2,474	*
210C	Shane-Gerber complex, 2 to 8 percent slopes-----	822	*
210E	Shane-Barkof-Gerber complex, 8 to 25 percent slopes-----	1,697	*
211F	Cabbart-Yawdim-Rock outcrop complex, 25 to 70 percent slopes-----	50,733	2.0
212F	Cabbart-Hillon loams, 25 to 70 percent slopes-----	18,142	0.7
221E	Hillon-Kevin clay loams, 8 to 25 percent slopes-----	31,502	1.2
222D	Hillon-Delpoint loams, 8 to 25 percent slopes-----	3,811	0.2
223E	Hillon-Fleak complex, 15 to 35 percent slopes-----	4,880	0.2
224E	Hillon-Joplin loams, 8 to 25 percent slopes-----	26,106	1.0
227F	Hillon-Fleak-Rock outcrop complex, 25 to 70 percent slopes-----	1,905	*
229E	Hillon-Lambeth complex, 15 to 35 percent slopes-----	906	*
232A	Acel silty clay loam, 0 to 2 percent slopes-----	4,270	0.2
251C	Bascovy-Neldore silty clays, 2 to 8 percent slopes-----	2,661	0.1
251E	Bascovy-Neldore silty clays, 8 to 25 percent slopes-----	22,467	0.9
252C	Bascovy-Marvan silty clays, 2 to 8 percent slopes-----	6,332	0.2
261B	Absher-Nobe complex, 0 to 4 percent slopes-----	2,466	*
263A	Toston clay loam, 0 to 1 percent slopes-----	4,359	0.2
264A	Toston-Nobe complex, 0 to 1 percent slopes-----	2,158	*
265B	Absher-Gerdrum complex, 0 to 4 percent slopes-----	1,002	*
272C	Attewan-Tinsley complex, 2 to 8 percent slopes-----	5,603	0.2
301A	Marvan-Vanda clays, 0 to 2 percent slopes-----	1,799	*
301C	Marvan-Vanda clays, 2 to 8 percent slopes-----	10,907	0.4
303A	Flatcreek-Nobe silty clays, 0 to 2 percent slopes-----	3,753	0.1
305A	Marvan-Nobe clays, 0 to 2 percent slopes-----	1,302	*
311B	Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes-----	19,221	0.8
311C	Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes-----	3,190	0.1
323B	Sagedale silty clay loam, 0 to 4 percent slopes-----	6,099	0.2
323C	Sagedale silty clay loam, 4 to 8 percent slopes-----	4,998	0.2
324B	Marcott silty clay loam, 0 to 3 percent slopes-----	1,684	*
331B	Phillips-Elloam complex, 0 to 4 percent slopes-----	50,219	2.0
331C	Phillips-Elloam complex, 4 to 8 percent slopes-----	7,260	0.3
334B	Phillips-Kevin complex, 0 to 4 percent slopes-----	4,837	0.2
341B	Linnet-Marias silty clays, 0 to 4 percent slopes-----	3,727	0.1
351B	Kenilworth-Fortbenton fine sandy loams, 0 to 3 percent slopes-----	16,829	0.7

*See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
361B	Fortbenton fine sandy loam, 0 to 4 percent slopes-----	29,039	1.1
362C	Chinook-Yetull complex, 2 to 10 percent slopes-----	5,798	0.2
363B	Cozberg-Chinook fine sandy loams, 0 to 4 percent slopes-----	2,069	*
363C	Chinook-Lihen fine sandy loams, 2 to 10 percent slopes-----	5,389	0.2
364B	Chinook loam, 0 to 4 percent slopes-----	2,156	*
364C	Chinook loam, 4 to 8 percent slopes-----	852	*
365B	Fortbenton-Chinook fine sandy loams, 0 to 6 percent slopes-----	8,065	0.3
368C	Fortbenton-Hillon complex, 2 to 8 percent slopes-----	5,339	0.2
372C	Evanston-Yamacall loams, 2 to 8 percent slopes-----	1,973	*
375B	Evanston-Lonna loams, 0 to 4 percent slopes-----	4,796	0.2
377B	Evanston-Degrad loams, 0 to 4 percent slopes-----	1,550	*
381B	Ethridge clay loam, 0 to 4 percent slopes-----	3,877	0.2
385B	Ethridge-Kobase silty clay loams, 0 to 4 percent slopes-----	31,719	1.2
386B	Ethridge-Evanston complex, 0 to 4 percent slopes-----	1,575	*
388A	Ethridge-Lonna silty clay loams, 0 to 2 percent slopes-----	14,557	0.6
402A	Gerdrum-Absher-Creed complex, 0 to 2 percent slopes-----	9,109	0.4
410	Rock outcrop-Fleak complex, 25 to 70 percent slopes-----	1,396	*
411D	Farnuf-Reeder loams, 4 to 15 percent slopes-----	3,782	0.1
411E	Reeder-Farnuf loams, 8 to 25 percent slopes-----	9,993	0.4
421C	Joplin-Hillon loams, 2 to 8 percent slopes-----	30,763	1.2
422C	Marmarth loam, 2 to 8 percent slopes-----	2,034	*
441C	Kevin-Hillon clay loams, 2 to 8 percent slopes-----	38,269	1.5
442C	Kevin-Elloam clay loams, 2 to 8 percent slopes-----	7,130	0.3
444D	Kevin-Scobey clay loams, 8 to 15 percent slopes-----	3,786	0.1
451C	Turner-Beaverton complex, 2 to 8 percent slopes-----	1,383	*
460	Laceyreek loam, 8 to 25 percent slopes, moist-----	3,365	0.1
471B	Marias-Kobase complex, 0 to 4 percent slopes-----	14,353	0.6
481A	Bigsag silty clay, 0 to 2 percent slopes-----	4,417	0.2
493A	Enbar-Straw-Eagleton loams, 0 to 2 percent slopes-----	3,613	0.1
503B	Telstad-Joplin loams, 0 to 4 percent slopes-----	187,597	7.4
503C	Telstad-Joplin loams, 4 to 8 percent slopes-----	67,827	2.7
510	Rock outcrop-Belain complex, 15 to 45 percent slopes-----	2,107	*
511A	Martinsdale-Turner loams, 0 to 2 percent slopes-----	1,835	*
511C	Martinsdale loam, 2 to 8 percent slopes-----	1,623	*
512C	Martinsdale stony loam, 4 to 15 percent slopes-----	1,313	*
521B	Thoeny-Elloam-Absher complex, 0 to 4 percent slopes-----	7,630	0.3
530F	Warwood loam, 15 to 45 percent slopes-----	681	*
531A	Sweetgrass-Beaverton complex, 0 to 2 percent slopes-----	5,409	0.2
531C	Sweetgrass-Beaverton complex, 2 to 8 percent slopes-----	3,747	0.1
550F	Libeg-Arrowpeak-Elkner complex, 25 to 70 percent slopes-----	13,091	0.5
551B	Lonesome loamy fine sand, 0 to 6 percent slopes-----	1,744	*
560F	Elve-Rock outcrop complex, 25 to 70 percent slopes-----	1,438	*
561B	Scobey-Kevin clay loams, 0 to 4 percent slopes-----	174,784	6.9
561C	Scobey-Kevin clay loams, 4 to 8 percent slopes-----	68,709	2.7
562B	Scobey-Linnet complex, 0 to 4 percent slopes-----	17,169	0.7
563A	Fortbenton-Scobey fine sandy loams, 0 to 3 percent slopes-----	9,399	0.4
580F	Garlet-Elkner complex, 25 to 70 percent slopes-----	11,083	0.4
601A	Havre-Glendive complex, 0 to 1 percent slopes-----	2,171	*
602A	Havre silty clay loam, 0 to 1 percent slopes-----	3,808	0.2
603A	Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded-----	13,928	0.6
605C	Yamacall-Havre loams, 0 to 8 percent slopes-----	22,322	0.9
621E	Sagedale-Wayden silty clay loams, 8 to 25 percent slopes-----	6,689	0.3
621F	Wayden-Sagedale silty clay loams, 25 to 60 percent slopes-----	13,757	0.5
623F	Linwell-Winifred clay loams, 15 to 45 percent slopes-----	9,432	0.4
630E	Crow-Lubrecht loams, 8 to 35 percent slopes-----	1,215	*
641F	Norbert-Barkof silty clays, 25 to 60 percent slopes-----	4,108	0.2
650D	Laceyreek-Ambrant complex, 4 to 15 percent slopes-----	298	*
650F	Laceyreek-Eaglecreek loams, 15 to 45 percent slopes-----	1,653	*
653F	Fleak-Twilight-Yetull complex, 25 to 70 percent slopes-----	4,918	0.2
654F	Fleak-Twilight-Rock outcrop complex, 25 to 70 percent slopes-----	6,130	0.2
661E	Twilight-Fleak complex, 8 to 25 percent slopes-----	7,427	0.3

* See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
671B	Bearpaw-Vida clay loams, 0 to 4 percent slopes-----	144,043	5.7
671C	Bearpaw-Vida clay loams, 4 to 8 percent slopes-----	66,411	2.6
673A	Bearpaw-Daglum complex, 0 to 2 percent slopes-----	1,003	*
674B	Bearpaw-Waltham clay loams, 0 to 4 percent slopes-----	5,886	0.2
680F	Winkler-Ambrant complex, 25 to 60 percent slopes-----	4,796	0.2
681C	Gerber clay, 4 to 8 percent slopes-----	994	*
691D	Vida-Williams loams, 8 to 15 percent slopes-----	2,575	0.1
692D	Vida-Bearpaw clay loams, 4 to 15 percent slopes-----	11,226	0.4
693C	Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes-----	5,105	0.2
701E	Work-Absarokee clay loams, 8 to 25 percent slopes-----	8,721	0.3
702E	Work-Absarokee stony loams, 8 to 35 percent slopes-----	6,367	0.2
721E	Zahill-Vida clay loams, 8 to 25 percent slopes-----	23,497	0.9
722F	Zahill-Sagedale-Wayden complex, 15 to 45 percent slopes-----	5,118	0.2
723F	Zahill-Cabba complex, 15 to 45 percent slopes-----	4,987	0.2
731F	Yetull-Dune land complex, 15 to 45 percent slopes-----	299	*
741B	Shambo-Straw loams, 0 to 4 percent slopes-----	3,710	0.1
745F	Shambo-Amor-Cabba loams, 15 to 45 percent slopes-----	12,545	0.5
761C	Hedoes-Belain loams, 2 to 8 percent slopes-----	651	*
761E	Hedoes-Belain loams, 8 to 25 percent slopes-----	7,764	0.3
793B	Yamacall clay loam, 0 to 4 percent slopes-----	4,120	0.2
793C	Yamacall clay loam, 4 to 8 percent slopes-----	1,740	*
795C	Yamacall-Benz clay loams, 2 to 8 percent slopes-----	2,667	0.1
795D	Yamacall-Benz clay loams, 8 to 15 percent slopes-----	1,111	*
801B	Williams-Vida loams, 0 to 4 percent slopes-----	4,776	0.2
801C	Williams-Vida loams, 4 to 8 percent slopes-----	6,054	0.2
828A	Savage loam, 0 to 2 percent slopes-----	1,095	*
842A	Savage-Daglum complex, 0 to 2 percent slopes-----	1,869	*
863E	Work-Roy complex, 8 to 25 percent slopes-----	3,989	0.2
871B	Tamaneen cobbly clay loam, 0 to 4 percent slopes-----	2,017	*
871C	Tamaneen cobbly clay loam, 4 to 8 percent slopes-----	502	*
883F	Perma-Whitlash complex, 25 to 70 percent slopes-----	18,668	0.7
892F	Whitlash-Belain-Rock outcrop complex, 25 to 60 percent slopes-----	2,334	*
895F	Belain-Whitlash, moist-Hedoes complex, 15 to 60 percent slopes-----	18,124	0.7
896E	Belain-Whitlash-Rock outcrop complex, 8 to 25 percent slopes-----	1,091	*
911F	Belain-Whitlash-Hedoes complex, 15 to 45 percent slopes-----	34,432	1.4
916C	Belain-Hedoes sandy loams, 2 to 8 percent slopes-----	1,228	*
925F	Sunburst-Lambeth complex, 25 to 70 percent slopes-----	17,765	0.7
941D	Busby-Twilight fine sandy loams, 4 to 15 percent slopes-----	3,895	0.2
943C	Tally fine sandy loam, 2 to 8 percent slopes-----	1,956	*
943E	Tally-Vebar fine sandy loams, 8 to 25 percent slopes-----	3,757	0.1
943F	Tally-Cohagen fine sandy loams, 25 to 60 percent slopes-----	3,506	0.1
965F	Cabba-Macar loams, 15 to 60 percent slopes-----	10,922	0.4
971F	Neldore-Bascovy silty clays, 25 to 60 percent slopes-----	48,125	1.9
972F	Neldore-Rock outcrop complex, 25 to 70 percent slopes-----	31,926	1.3
974F	Neldore-Hillon complex, 25 to 70 percent slopes-----	33,087	1.3
DA	Denied access-----	4,800	0.2
M-W	Miscellaneous Water-----	30	*
W	Water-----	15,060	0.6
	Total-----	2,526,082	100.0

* Less than 0.1 percent.

Soil Series and Detailed Map Units

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

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (Soil Survey Staff, 1993). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (USDA-NRCS, 1999). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

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

Minor component soil areas 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 minor component areas 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 component areas 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, Martinsdale stony loam, 4 to 15 percent slopes, is one of several phases in the Martinsdale 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. Scobey-Kevin clay loams, 0 to 4 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. Associations were not mapped in this survey area.

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. Undifferentiated groups were not mapped in this survey area.

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

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of the manuscript 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.

Absarokee Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

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

Landform: Sedimentary plains, hills

Parent material: Residuum from interbedded sandstone and shale

Slope range: 0 to 35 percent

Annual precipitation: 17 to 19 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine, montmorillonitic Typic Argiborolls

Typical Pedon

Absarokee clay loam, 4 to 8 percent slopes, in cropland, 1,200 feet north and 50 feet west of the southeast corner of sec. 33, T. 21 N., R. 7 E.

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

Bt1—7 to 13 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; strong medium prismatic structure parting to strong fine subangular blocky; very hard, friable, sticky and plastic; common fine and very fine roots; many very fine tubular pores; many distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—13 to 18 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; many distinct clay films on faces of peds; neutral; clear wavy boundary.

Bk—18 to 34 inches; very pale brown (10YR 7/3) clay loam, light yellowish brown (10YR 6/4) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; common fine and few medium masses of lime; violently effervescent; moderately alkaline; gradual irregular boundary.

Cr—34 to 60 inches; very pale brown (10YR 7/4) and light gray (10YR 7/2) interbedded sandstone and shale, light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) moist; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 12 inches

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

Depth to bedrock: 20 to 40 inches

Depth to the Bk horizon: 12 to 24 inches

Ap horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Texture: loam or clay loam

Clay content: 20 to 35 percent

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

Reaction: pH 6.1 to 7.3

Bt1 horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay loam or clay

Clay content: 35 to 50 percent

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

Reaction: pH 6.6 to 7.8

Bt2 horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3 or 4

Texture: clay loam or clay

Clay content: 35 to 50 percent

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

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 2.5Y, 10YR, or 7.5YR

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

Chroma: 3 or 4

Clay content: 30 to 40 percent

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

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

57B—Absarokee clay loam, 0 to 4 percent slopes

Setting

Landform: Sedimentary plains

Slope: 0 to 4 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Absarokee and similar soils: 85 percent

Minor Components

Work and similar soils: 0 to 7 percent

Soils shallow to bedrock: 0 to 5 percent

Very channery surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

57C—Absarokee clay loam, 4 to 8 percent slopes

Setting

Landform: Sedimentary plains

Slope: 4 to 8 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Absarokee and similar soils: 85 percent

Minor Components

Work and similar soils: 0 to 7 percent

Soils shallow to bedrock: 0 to 5 percent

Very channery surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

57E—Absarokee-Reeder complex, 8 to 25 percent slopes

Setting

Landform:

* Absarokee—Hills

* Reeder—Hills

Slope:

* Absarokee—8 to 25 percent

* Reeder—8 to 25 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Absarokee and similar soils: 50 percent

Reeder and similar soils: 35 percent

Minor Components

Soils shallow to bedrock: 0 to 5 percent

Work and similar soils: 0 to 3 percent

Farnuf and similar soils: 0 to 3 percent

Very channery soils: 0 to 2 percent

Slopes more than 25 percent: 0 to 2 percent

Major Component Description

Absarokee

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Reeder

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Absher Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Moderately well drained or well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Alluvial fans, stream terraces, small drainageways, till plains

Parent material: Glaciofluvial deposits, glacial till

Slope range: 0 to 4 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Absher clay, in an area of Absher-Nobe complex, 0 to 4 percent slopes, in rangeland, 1,250 feet north and 300 feet west of the southeast corner of sec. 16, T. 28 N., R. 13 E.

E—0 to 2 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; neutral; clear smooth boundary.

Btn—2 to 8 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong medium columnar structure parting to strong fine and medium subangular blocky; very hard, very firm, very sticky and very plastic; common very fine and fine roots along faces of peds; common very fine tubular pores; many distinct clay films on

faces of peds; many unstained sand grains on tops of columns; mildly alkaline; clear smooth boundary.

Btnyz—8 to 11 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very firm, sticky and plastic; common very fine and fine roots; common very fine tubular pores; many distinct clay films on faces of peds; common fine seams and masses of gypsum and other salts; slightly effervescent; moderately alkaline; clear wavy boundary.

Bknyz1—11 to 15 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; common fine seams and masses of gypsum and other salts; few fine seams of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bknyz2—15 to 42 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; few very fine tubular pores; common fine and medium seams and masses of lime, gypsum and other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bnyz—42 to 60 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, sticky and plastic; few very fine tubular pores; common fine and medium seams and masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Control section: 2 to 11 inches

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

Depth to the Btnyz horizon: 6 to 15 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: the surface layer is clay when mixed to 7 inches

Clay content: 40 to 55 percent

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 6.6 to 8.4

Btn horizon

Hue: 2.5Y, 7.5YR, or 10YR

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

Chroma: 1, 2, or 3

Texture: silty clay, clay, or clay loam

Clay content: 35 to 60 percent

Structure: moderate or strong columnar or prismatic

Consistence: very hard or extremely hard when dry

Rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 18 to 70

Reaction: pH 7.4 to 9.0

Btnyz horizon

Hue: 2.5Y, 10YR, or 7.5YR

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

Chroma: 2 or 3

Texture: clay loam, clay, or silty clay

Clay content: 35 to 50 percent

Rock fragments: 0 to 20 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 18 to 70

Gypsum content: 1 to 5 percent

Reaction: pH 7.9 to 9.0

Some pedons have Btknyz horizons.

Bknyz and Bnyz horizons

Hue: 2.5Y, 10YR, or 7.5YR

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

Chroma: 2, 3, or 4

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

Clay content: 35 to 50 percent

Rock fragments: 0 to 20 percent pebbles

Calcium carbonate equivalent: 4 to 15 percent

Electrical conductivity: 16 to 30 mmhos/cm

Sodium adsorption ratio: 23 to 70

Gypsum content: 1 to 5 percent

Reaction: pH 7.9 to 9.0

265B—Absher-Gerdrum complex, 0 to 4 percent slopes

Setting

Landform:

* Absher—Alluvial fans, stream terraces, and drainageways

* Gerdrum—Alluvial fans, stream terraces, and drainageways

Position on landform:

- * Absher—Microlows
- * Gerdrum—Microhighs

Slope:

- * Absher—0 to 4 percent
- * Gerdrum—0 to 4 percent

Mean annual precipitation: 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Absher and similar soils: 55 percent
 Gerdrum and similar soils: 35 percent

Minor Components

Creed and similar soils: 0 to 5 percent
 Ferd and similar soils: 0 to 3 percent
 Very gravelly substratums: 0 to 2 percent

Major Component Description**Absher***Surface layer texture:* Clay*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Glaciofluvial deposits*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 4.1 inches**Gerdrum***Surface layer texture:* Clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Glaciofluvial deposits*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 6.1 inches**Management**

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

261B—Absher-Nobe complex, 0 to 4 percent slopes**Setting***Landform:*

- * Absher—Alluvial fans, stream terraces, and drainageways

- * Nobe—Alluvial fans, stream terraces, and drainageways

Position on landform:

- * Absher—Microlows

- * Nobe—Microhighs

Slope:

- * Absher—0 to 4 percent

- * Nobe—0 to 4 percent

Mean annual precipitation: 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Absher and similar soils: 55 percent
 Nobe and similar soils: 35 percent

Minor Components

Gerdrum and similar soils: 0 to 7 percent
 Somewhat poorly drained soils: 0 to 3 percent

Major Component Description**Absher***Surface layer texture:* Clay*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Glaciofluvial deposits*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within 30 inches*Sodium affected:* Sodic within 30 inches*Available water capacity:* Mainly 4.1 inches**Nobe***Surface layer texture:* Silty clay*Depth class:* Very deep (more than 60 inches)*Dominant parent material:* Glaciofluvial deposits*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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Acel Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Poorly defined drainageways, alluvial fans, stream terraces

Parent material: Glaciofluvial deposits

Slope range: 0 to 2 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Mollic Eutroboralfs

Typical Pedon

Acel silty clay loam, 0 to 2 percent slopes, in cropland, 200 feet west and 500 feet north of the southeast corner of sec. 36, T. 23 N., R. 4 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium granular structure with a hard surface crust; massive when dry; hard, friable, sticky and plastic; few very fine roots; many unstained grains of silt and sand; neutral; abrupt smooth boundary.

Bt1—6 to 12 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and very plastic; few very fine tubular pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—12 to 20 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and very plastic; few very fine roots; many very fine tubular pores; many distinct clay films on faces of peds; neutral; gradual wavy boundary.

Bk1—20 to 26 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; many very fine and few fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—26 to 31 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; many very fine and few fine tubular pores; few pebbles that have lime coats on undersides; common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bck—31 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; common very fine tubular pores; few fine seams and masses of lime; slightly effervescent; moderately alkaline.

Range in Characteristics

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

Depth to the Bk horizon: 15 to 25 inches

Ap horizon

Hue: 2.5Y or 10YR

Clay content: 27 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

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

Bt horizons

Hue: 2.5Y or 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: silty clay or clay

Clay content: 40 to 55 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Bk and Bck horizons

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2, 3, or 4

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

Clay content: 35 to 45 percent

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 15 percent pebbles
 Calcium carbonate equivalent: 1 to 15 percent
 Reaction: pH 7.9 to 9.0
 Some pedons have a By or Bky horizon below 40 inches.

232A—Acel silty clay loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 2 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Acel and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 5 percent
 Acel clay loam: 0 to 3 percent
 Moderately saline soils: 0 to 3 percent
 Nishon and similar soils: 0 to 3 percent
 Stratified, sandy substratums: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Ambrant Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour) to 43 inches; rapid below this depth (6.0 to 20.0 inches/hour)

Landform: Mountains, alluvial fans, stream terraces
Parent material: Residuum, colluvium, or alluvium from igneous rocks
Slope range: 4 to 60 percent
Annual precipitation: 18 to 24 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 100 days

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

Typical Pedon

Ambrant sandy loam, in an area of Winkler-Ambrant complex, 25 to 60 percent slopes, in forest, 700 feet south and 1,600 feet west of the northeast corner of sec. 16, T. 28 N. R. 15 E.

O—3 inches to 0; slightly decomposed forest litter.

A—0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky and moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots and common medium and coarse roots; 10 percent small pebbles; neutral; clear smooth boundary.

E1—4 to 8 inches; light brownish gray (10YR 6/2) coarse sandy loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; common medium and coarse roots; many very fine irregular pores and few fine irregular pores; 10 percent small pebbles; neutral; gradual wavy boundary.

E2—8 to 21 inches; pale brown (10YR 6/3) coarse sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots and common medium roots; many very fine irregular pores and common fine irregular pores; 10 percent small pebbles; neutral; gradual wavy boundary.

E and Bt—21 to 43 inches; E part (60 percent) pale brown (10YR 6/3) coarse sandy loam, brown (10YR 4/3) moist; B part (40 percent) brown (10YR 5/3) coarse sandy loam lamellae, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine and medium roots; many very fine irregular pores and common medium pores; few dark yellowish brown (10YR 4/4) iron stains; 10 percent small pebbles; neutral; gradual wavy boundary.

2C—43 to 60 inches; light brownish gray (10YR 6/2) gravelly loamy coarse sand, dark grayish brown (10YR 4/2) moist; single grain; loose, very friable, nonsticky and nonplastic; few fine and very fine roots; many very fine irregular pores and common fine irregular pores; 25 percent pebbles; neutral.

Range in Characteristics

Content of clay in the control section: 15 to 18 percent
Rock fragments in the control section: 10 to 35 percent

A horizon

Value: 4 or 5 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 5 to 15 percent
Reaction: pH 5.6 to 7.3

E1 horizon

Value: 5, 6, or 7 dry; 3 or 4 moist
Chroma: 2 or 3
Texture: sandy loam or loam
Clay content: 5 to 15 percent
Rock fragments: 0 to 35 percent—0 to 25 percent cobbles, stones, or boulders; 5 to 35 percent angular pebbles
Reaction: pH 5.6 to 7.3

E2 horizon

Hue: 10YR or 2.5Y
Value: 6 or 7 dry, 4 or 5 moist
Chroma: 1, 2, or 3
Texture: coarse sandy loam or loamy coarse sand
Clay content: 5 to 15 percent
Rock fragments: 0 to 35 percent—0 to 10 percent cobbles, stones, or boulders; 5 to 35 percent angular pebbles
Reaction: pH 5.6 to 7.3

E and Bt horizon

Hue: E part 10YR or 2.5Y, Bt part 10YR or 2.5Y
Value: E part 6 or 7, B part 4 or 5 dry; E part 4, 5, or 6, B part 3 or 4 moist
Chroma: E part 2 or 3, B part 2 or 3
Clay content, mixed: 5 to 18 percent, lamellae has less than 3 percent clay increase
Texture: sandy loam or coarse sandy loam
Rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 10 to 35 percent angular pebbles
Reaction: pH 5.6 to 7.3

2C horizon

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry, 4 or 5 moist
Chroma: 1, 2, 3, or 4
Texture: coarse sandy loam, coarse sand, loamy coarse sand, sand, or loamy sand

Clay content: 0 to 5 percent
Rock fragments: 15 to 60 percent—10 to 25 percent cobbles and stones, 10 to 45 percent angular pebbles
Reaction: pH 5.6 to 7.3

Amor Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Hills

Parent material: Residuum from interbedded sandstone and shale

Slope range: 15 to 45 percent

Annual precipitation: 17 to 19 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed Typic Haploborolls

Typical Pedon

Amor loam, in an area of Shambo-Amor-Cabba loams, 15 to 45 percent slopes, in rangeland, 1,100 feet west and 1,800 feet north of the southeast corner of sec. 17, T. 21 N., R. 9 E.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine and few medium roots; slightly effervescent; neutral; clear wavy boundary.

Bw—5 to 14 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; strong fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; many fine and very fine and few medium roots; many very fine tubular pores; strongly effervescent; mildly alkaline; clear wavy boundary.

Bk1—14 to 25 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; many fine and very fine tubular pores; common fine seams and masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—25 to 34 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; hard,

very friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; many very fine tubular pores; many fine seams and masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—34 to 60 inches; light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) interbedded sandstone and shale, grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) moist; few fine roots in upper part; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches

Depth to bedrock: 20 to 40 inches

Depth to the Bk horizon: 10 to 20 inches

A horizon

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

Chroma: 2 or 3

Clay content: 15 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.3

Bw 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: loam, sandy clay loam, clay loam, or fine sandy loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

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

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 8.4

Arrowpeak Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

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

Landform: Mountains

Parent material: Residuum from igneous rock

Slope range: 25 to 70 percent

Annual precipitation: 20 to 28 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed Lithic Cryoborolls

Typical Pedon

Arrowpeak very cobbly loam, in an area of Libeg-Arrowpeak-Elkner complex, 25 to 70 percent slopes, in rangeland, 700 feet south and 200 feet west of the northeast corner of sec. 7, T. 20 N., R. 9 E.

A—0 to 8 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine and few medium roots; 20 percent pebbles and 30 percent cobbles, few surface stones; neutral; clear wavy boundary.

Bw—8 to 17 inches; brown (10YR 5/3) extremely cobbly loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine and few medium roots; many very fine tubular and irregular pores; 40 percent pebbles and 30 percent cobbles; neutral; clear wavy boundary.

R—17 inches; hard, fractured igneous bedrock.

Range in Characteristics

Mollic epipedon thickness: 7 to 20 inches

Content of clay in the control section: 10 to 20 percent

Rock fragments in the control section: 50 to 80 percent

Depth to bedrock: 10 to 20 inches

A horizon

Value: 3 or 4 dry, 2 or 3 moist

Clay content: 10 to 20 percent

Rock fragments: 35 to 60 percent—20 to 25 percent pebbles or channers, 15 to 30 percent cobbles, 0 to 5 percent stones

Reaction: pH 6.1 to 7.3

Bw horizon

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: loam or sandy loam

Clay content: 10 to 20 percent

Rock fragments: 50 to 80 percent—25 to 30 percent pebbles or channers, 45 percent cobbles, 0 to 5 percent stones

Reaction: pH 6.1 to 7.3

Assinniboine Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to 16 inches; below this depth moderately rapid (2.0 to 6.0 inches/hour)

Landform: Alluvial fans, stream terraces, small drainageways

Parent material: Glaciofluvial deposits, eolian deposits, alluvium

Slope range: 0 to 4 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Assinniboine fine sandy loam, 0 to 4 percent slopes, in cropland, 1,600 feet south and 2,600 feet west of the northeast corner of sec. 17, T. 26 N., R. 12 E.

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

Bt1—6 to 10 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; few faint clay films on faces of peds; neutral; clear wavy boundary.

Bt2—10 to 16 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores; many faint clay films on faces of peds; neutral; clear wavy boundary.

Bk1—16 to 32 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; slightly

hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; few fine masses of lime; slightly effervescent; mildly alkaline; gradual wavy boundary.

Bk2—32 to 48 inches; light gray (2.5Y 7/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; many fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bck—48 to 60 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular and irregular pores; few small lime coated pebbles; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 12 inches

Content of clay in the control section: 18 to 27 percent

Depth to the Bk horizon: 14 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Texture: loam or fine sandy loam

Clay content: 5 to 25 percent

Rock fragments: 0 to 25 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: sandy clay loam or fine sandy loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 2.5Y or 10YR

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

Chroma: 2, 3, or 4

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

Clay content: 10 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4
Some pedons have a Btk horizon

*B*Ck horizon

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

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

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Assinniboine and similar soils: 90 percent

Minor Components

Lihen and similar soils: 0 to 3 percent
Assinniboine loam: 0 to 3 percent
Evanston and similar soils: 0 to 2 percent
Kenilworth and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or eolian material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

39B—Assinniboine loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Assinniboine and similar soils: 85 percent

Minor Components

Assinniboine fine sandy loam: 0 to 5 percent
Cozberg and similar soils: 0 to 5 percent
Evanston and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Attewan Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour) to 27 inches; below this depth rapid (6.0 to 20.0 inches/hour)
Landform: Outwash plains
Parent material: Glacial outwash
Slope range: 0 to 4 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Attewan loam, in an area of Attewan-Tinsley complex, 2 to 8 percent slopes, in rangeland, 2,300 feet north and 15 feet east of the southwest corner of sec. 36, T. 25 N., R. 10 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine roots and few medium roots; neutral; abrupt wavy boundary.

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

Bt2—12 to 17; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; hard, very friable, sticky and plastic; few fine roots; many very fine tubular pores; common faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk—17 to 27 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; common medium masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2Ck—27 to 36 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few fine roots; many fine irregular pores; 15 percent cobbles, 50 percent pebbles; lime coatings on undersides of rock fragments; disseminated lime; violently effervescent; moderately alkaline; clear wavy boundary.

2C—36 to 60 inches; light brownish gray and grayish brown (10YR 6/2 and 5/2) very gravelly coarse sand, brown (10YR 4/3) moist; single grain; loose,

nonsticky and nonplastic; many fine irregular pores; 5 percent cobbles, 50 percent pebbles; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 12 inches

Depth to the Bk horizon: 10 to 20 inches

Depth to the 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

Clay content: 10 to 20 percent

Rock fragments: 0 to 50 percent—0 to 20 percent greater than 3 inch stones and cobbles, 0 to 30 percent less than 3-inch pebbles

Reaction: pH 6.1 to 7.8

Bt horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: clay loam, sandy clay loam, or loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 25 percent—0 to 5 percent greater than 3 inch stones and cobbles, 0 to 20 percent less than 3-inch pebbles

Reaction: pH 6.6 to 7.8

Bk 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: loam, clay loam, silt loam, sandy clay loam, or sandy loam

Clay content: 15 to 30 percent

Rock fragments: 0 to 30 percent—0 to 5 percent stones and cobbles, 0 to 25 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

2C horizons

Hue: 2.5Y or 10YR

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

Chroma: 2, 3, or 4

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

Clay content: 0 to 10 percent

Rock fragments: 35 to 75 percent—0 to 15 percent stones and cobbles, 35 to 60 percent pebbles

Reaction: pH 7.4 to 8.4

27B—Attewan loam, 0 to 4 percent slopes**Setting**

Landform: Outwash plains

Slope: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Attewan and similar soils: 85 percent

Minor Components

Attewan sandy loam: 0 to 5 percent

Tinsley and similar soils: 0 to 5 percent

Evanston and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glacial outwash

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

272C—Attewan-Tinsley complex, 2 to 8 percent slopes**Setting**

Landform:

* Attewan—Outwash plains

* Tinsley—Relict stream terraces

Position on landform:

* Attewan—Foothills

* Tinsley—Backslopes and shoulders

Slope:

* Attewan—2 to 4 percent

* Tinsley—2 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Attewan and similar soils: 55 percent

Tinsley and similar soils: 35 percent

Minor Components

Chinook and similar soils: 0 to 3 percent

Evanston and similar soils: 0 to 3 percent

Degrad and similar soils: 0 to 2 percent

Slopes more than 8 percent: 0 to 2 percent

Major Component Description**Attewan**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glacial outwash

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.0 inches

Tinsley

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Glacial outwash

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

200—Badland**Composition****Major Components**

Badland: 90 percent

Minor Components

Cabbart and similar soils: 0 to 2 percent

Yawdim and similar soils: 0 to 2 percent



Figure 3. Typical area of Badland in the eastern part of the survey area.

Yamacall and similar soils: 0 to 2 percent
 Marvan and similar soils: 0 to 2 percent
 Weingart and similar soils: 0 to 1 percent
 Delpoint and similar soils: 0 to 1 percent

Major Component Description

Definition: Steep or very steep, barren land dissected by many intermittent drainage channels (fig. 3)

Management

For management information about this map unit see appropriate sections in Part II of this publication.

Barkof Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)

Landform: Hills

Parent material: Residuum from shale

Slope range: 8 to 45 percent

Annual precipitation: 14 to 19 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 90 to 120 days

Taxonomic Class: Fine, montmorillonitic, frigid Leptic Udic Haplusterts

Typical Pedon

Barkof silty clay, in an area of Norbert-Barkof silty clays, 25 to 60 percent slopes, in rangeland, 2,400 feet east and 2,400 feet south of the northwest corner of sec. 33, T. 22 N., R. 9 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; very hard, friable, very

sticky and very plastic; common very fine and fine roots; mildly alkaline; clear smooth boundary.

Bss—4 to 14 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; extremely hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; few intersecting slickensides; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkssy—14 to 24 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few very fine and fine roots; common very fine tubular pores; few intersecting slickensides; common fine and medium masses of lime and gypsum; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—24 to 60 inches; grayish brown (2.5Y 5/2) shale, dark grayish brown (2.5Y 4/2) moist; few fine masses of gypsum; slightly effervescent; mildly alkaline.

Range in Characteristics

Content of clay in the control section: 45 to 60 percent
Depth to the Cr horizon: 20 to 40 inches

A horizon

Hue: 5Y, 2.5Y, or 10YR
Value: 4 or 5 dry, 4 or 5 moist
Chroma: 2, 3, or 4
Clay content: 40 to 55 percent
Rock fragments: 0 to 30 percent—0 to 15 percent greater than 3 inches, 0 to 15 percent pebbles
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

Bss horizon

Hue: 5Y, 2.5Y, or 10YR
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 2, 3, or 4
Texture: clay or silty clay
Clay content: 45 to 60 percent
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.9 to 9.0
Some pedons have a Bkssy horizon

Bkssy horizon

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

Clay content: 45 to 60 percent
Electrical conductivity: 2 to 4 mmhos/cm
Reaction: pH 7.9 to 9.0

Bascovy Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Sedimentary plains, hills

Parent material: Residuum from shale

Slope range: 2 to 45 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Leptic Udic Haplusterts

Typical Pedon

Bascovy silty clay, in an area of Bascovy-Neldore silty clays, 8 to 25 percent slopes, in rangeland, 500 feet south and 900 feet west of the northeast corner of sec. 24, T. 24 N., R. 12 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong fine and medium granular structure; hard, friable, sticky and plastic; common very fine and fine roots; neutral; clear smooth boundary.

Bss—4 to 15 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; extremely hard, firm, very sticky and very plastic; many very fine and fine roots; few very fine tubular pores; few intersecting slickensides; neutral; clear wavy boundary.

By—15 to 29 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, very sticky and very plastic; many very fine and fine roots; few very fine tubular pores; few fine and medium masses of gypsum; moderately acid; clear wavy boundary.

Cr—29 to 60 inches; grayish brown (2.5Y 5/2) shale, dark grayish brown (2.5Y 4/2) moist; few fine roots in fractures in the upper part, strongly acid.

Range in Characteristics

Content of clay in the control section: 45 to 60 percent
Depth to the Cr horizon: 20 to 40 inches

A horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 1, 2, or 3
 Clay content: 40 to 60 percent
 Electrical conductivity: 2 to 4 mmhos/cm
 Reaction: pH 6.6 to 7.8

Bss horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 1, 2, or 3
 Texture: clay or silty clay
 Clay content: 45 to 60 percent
 Electrical conductivity: 2 to 4 mmhos/cm
 Reaction: pH 6.1 to 7.8

By horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 1, 2, or 3
 Texture: clay or silty clay
 Clay content: 45 to 60 percent
 Gypsum content: 1 to 5 percent
 Electrical conductivity: 2 to 8 mmhos/cm
 Reaction: pH 5.1 to 7.3

252C—Bascovy-Marvan silty clays, 2 to 8 percent slopes**Setting***Landform:*

- * Bascovy—Sedimentary plains
- * Marvan—Sedimentary plains

Position on landform:

- * Bascovy—Backslopes and shoulders
- * Marvan—Footslopes

Slope:

- * Bascovy—2 to 8 percent
- * Marvan—2 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

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

Minor Components

Neldore and similar soils: 0 to 6 percent
 Vanda and similar soils: 0 to 3 percent

Kobase and similar soils: 0 to 3 percent
 Magonot and similar soils: 0 to 3 percent

Major Component Description**Bascovy**

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.4 inches

Marvan

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

251C—Bascovy-Neldore silty clays, 2 to 8 percent slopes**Setting***Landform:*

- * Bascovy—Sedimentary plains
- * Neldore—Sedimentary plains

Position on landform:

- * Bascovy—Footslopes
- * Neldore—Backslopes and shoulders

Slope:

- * Bascovy—2 to 8 percent
- * Neldore—2 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Bascovy and similar soils: 55 percent
 Neldore and similar soils: 35 percent

Minor Components

Weingart and similar soils: 0 to 5 percent
Marvan and similar soils: 0 to 5 percent

Major Component Description**Bascovy**

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.4 inches

Neldore

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

251E—Bascovy-Neldore silty clays, 8 to 25 percent slopes**Setting***Landform:*

- * Bascovy—Hills
- * Neldore—Hills

Position on landform:

- * Bascovy—Backslopes and footslopes
- * Neldore—Backslopes and shoulders

Slope:

- * Bascovy—8 to 25 percent
- * Neldore—8 to 25 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

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

Minor Components

Marvan and similar soils: 0 to 5 percent
Areas of rock outcrop: 0 to 3 percent
Calcareous soils: 0 to 3 percent
Weingart and similar soils: 0 to 2 percent
Megenot and similar soils: 0 to 2 percent

Major Component Description**Bascovy**

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.4 inches

Neldore

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Bearpaw Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains, hills
Parent material: Glacial till
Slope range: 0 to 15 percent
Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic
 Argiborolls

Typical Pedon

Bearpaw clay loam, 0 to 4 percent slopes, in cropland, 700 feet south and 600 feet west of the northeast corner of sec. 34, T. 22 N., R. 7 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; slightly hard, very friable, sticky and plastic; many very fine and fine roots; neutral; abrupt smooth boundary.

Bt1—6 to 12 inches: brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong fine subangular blocky; hard, firm, very sticky and very plastic; many very fine and fine roots; many very fine tubular pores; many distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—12 to 16 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong fine subangular blocky; hard, firm, sticky and plastic; many very fine and fine roots; many very fine tubular pores; many distinct clay films on faces of peds; neutral; clear wavy boundary.

Bk1—16 to 22 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to strong fine subangular blocky; hard, friable, sticky and plastic; common very fine and fine roots; many very fine pores; few fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—22 to 34 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; common very fine tubular pores; common fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BCKy—34 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few very

fine tubular pores; few lignite and shale chips; few pebbles; few medium masses of gypsum below 48 inches; few fine masses of lime; strongly effervescent; slightly effervescent below 48 inches; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 12 inches
Content of clay in the control section: 35 to 50 percent
Depth to the Bk horizon: 10 to 20 inches

Ap horizon

Value: 3, 4, or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 27 to 35 percent
 Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles
 Reaction: pH 6.1 to 7.8

Bt1 horizon

Value: 4 or 5 dry, 3 moist
 Chroma: 2 or 3
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles
 Reaction: pH 6.6 to 7.8

Bt2 horizon

Value: 4 or 5 dry, 3 or 4 moist
 Chroma: 2 or 3
 Texture: clay loam or clay
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles
 Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 2.5Y or 5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay loam, silty clay loam, or clay
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

BCKy horizon

Hue: 2.5Y or 5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay loam, silty clay loam, or clay
 Clay content: 30 to 45 percent

Rock fragments: 0 to 20 percent—0 to 5 percent cobbles, 0 to 15 percent pebbles
 Bulk density: 1.6 to 1.8 grams/cc
 Gypsum Content: 0 to 2 percent
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

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

Setting

Landform: Till plains
Slope: 0 to 4 percent
Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Bearpaw and similar soils: 85 percent

Minor Components

Vida and similar soils: 0 to 10 percent
 Waltham and similar soils: 0 to 3 percent
 Nishon and similar soils: 0 to 1 percent
 Zahill and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

67C—Bearpaw clay loam, 4 to 8 percent slopes

Setting

Landform: Till plains
Slope: 4 to 8 percent

Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Bearpaw and similar soils: 85 percent

Minor Components

Vida and similar soils: 0 to 9 percent
 Waltham and similar soils: 0 to 2 percent
 Slopes less than 4 percent: 0 to 2 percent
 Nishon and similar soils: 0 to 1 percent
 Zahill and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

673A—Bearpaw-Daglum complex, 0 to 2 percent slopes

Setting

Landform:
 * Bearpaw—Till plains
 * Daglum—Till plains
Position on landform:
 * Bearpaw—Microhighs
 * Daglum—Microlows

Slope:
 * Bearpaw—0 to 2 percent
 * Daglum—0 to 2 percent

Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Bearpaw and similar soils: 55 percent
 Daglum and similar soils: 30 percent

Minor Components

Gerber and similar soils: 0 to 10 percent
 Vida and similar soils: 0 to 4 percent
 Nishon and similar soils: 0 to 1 percent

Major Component Description**Bearpaw**

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Daglum

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

671B—Bearpaw-Vida clay loams, 0 to 4 percent slopes**Setting***Landform:*

- * Bearpaw—Till plains
- * Vida—Till plains

Position on landform:

- * Bearpaw—Foothills and toeslopes
- * Vida—Backslopes and shoulders

Slope:

- * Bearpaw—0 to 4 percent
- * Vida—0 to 4 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition**Major Components**

Bearpaw and similar soils: 55 percent
 Vida and similar soils: 30 percent

Minor Components

Zahill and similar soils: 0 to 6 percent
 Gerber and similar soils: 0 to 5 percent
 Waltham and similar soils: 0 to 3 percent
 Nishon and similar soils: 0 to 1 percent

Major Component Description**Bearpaw**

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Vida

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

671C—Bearpaw-Vida clay loams, 4 to 8 percent slopes**Setting***Landform:*

- * Bearpaw—Till plains
- * Vida—Till plains

Position on landform:

- * Bearpaw—Foothills and toeslopes
- * Vida—Backslopes and shoulders

Slope:

- * Bearpaw—4 to 8 percent
- * Vida—4 to 8 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition**Major Components**

Bearpaw and similar soils: 50 percent
Vida and similar soils: 35 percent

Minor Components

Zahill and similar soils: 0 to 6 percent
Gerber and similar soils: 0 to 5 percent
Waltham and similar soils: 0 to 3 percent
Nishon and similar soils: 0 to 1 percent

Major Component Description**Bearpaw**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.1 inches

Vida

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

674B—Bearpaw-Waltham clay loams, 0 to 4 percent slopes**Setting***Landform:*

- * Bearpaw—Till plains
- * Waltham—Till plains

Position on landform:

- * Bearpaw—Microhighs
- * Waltham—Microlows

Slope:

- * Bearpaw—0 to 4 percent
- * Waltham—0 to 4 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition**Major Components**

Bearpaw and similar soils: 55 percent
Waltham and similar soils: 30 percent

Minor Components

Vida and similar soils: 0 to 6 percent
Strongly saline/sodic soils: 0 to 5 percent
Zahill and similar soils: 0 to 3 percent
Nishon and similar soils: 0 to 1 percent

Major Component Description**Bearpaw**

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.1 inches

Waltham

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 7.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Beaverton Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to 15 inches; below this depth rapid (6.0 to 20.0 inches/hour)

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Loamy-skeletal over sandy or sandy-skeletal, mixed Typic Argiborolls

Typical Pedon

Beaverton very cobbly loam, in an area of Sweetgrass-Beaverton complex, 2 to 8 percent slopes, in rangeland, 800 feet east and 600 feet north of the southwest corner of sec. 36, T. 22 N., R. 9 E.

A—0 to 4 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots and few medium roots; 25 percent cobbles, 15 percent pebbles; neutral; clear smooth boundary.

Bt1—4 to 10 inches; brown (10YR 4/3) very gravelly clay loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; hard, friable, sticky and plastic; many very fine and fine roots; common very fine and fine tubular and irregular pores; many faint clay films on faces of peds; 10 percent cobbles, 40 percent pebbles; neutral; clear wavy boundary.

Bt2—10 to 15 inches; brown (10YR 5/3) very gravelly sandy clay loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; very hard, friable, sticky and plastic; many very fine and fine roots; common very fine and fine tubular and irregular pores; common faint clay films on faces of peds; 10 percent cobbles, 45 percent pebbles; neutral; clear wavy boundary.

2C—15 to 60 inches pale brown (10YR 6/3) extremely gravelly loamy sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few medium roots in upper part; 10 percent cobbles, 60 percent pebbles; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 14 inches and may include all or part of the Bt horizons

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

Rock fragments in the control section: 35 to 60 percent

Depth to the 2C horizon: 10 to 20 inches

A horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 5 to 60 percent—0 to 5 percent stones, 0 to 25 percent cobbles, 5 to 40 percent pebbles

Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 2.5Y, 10YR, or 7.5YR

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

Chroma: 2 or 3

Texture: clay loam or sandy clay loam

Clay content: 25 to 35 percent

Rock fragments: 35 to 60 percent—0 to 5 percent stones, 0 to 30 percent cobbles, 15 to 45 percent pebbles

Reaction: pH 6.6 to 7.8

2C horizon

Hue: 2.5Y, 10YR, or 7.5YR

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

Chroma: 2, 3, or 4

Texture: loamy sand or sand

Clay content: 0 to 10 percent

Rock fragments: 35 to 80 percent—0 to 10 percent stones, 0 to 35 percent cobbles, 15 to 60 percent pebbles

Calcium carbonate equivalent: 3 to 15 percent

Reaction: pH 7.4 to 8.4

12C—Beaverton complex, 2 to 8 percent slopes

Setting

Landform:

* Beaverton—Relict stream terraces

* Beaverton—Relict stream terraces

Position on landform:

* Beaverton—Treads

* Beaverton—Treads

Slope:

* Beaverton—2 to 8 percent

* Beaverton—2 to 8 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Beaverton and similar soils: 45 percent
Beaverton and similar soils: 40 percent

Minor Components

Beaverton stony loam: 0 to 5 percent
Sweetgrass and similar soils: 0 to 3 percent
Turner and similar soils: 0 to 3 percent
Very gravelly sand surfaces: 0 to 2 percent
Slopes more than 8 percent: 0 to 2 percent

Major Component Description

Beaverton

Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

Beaverton

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Belain Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour) to 18 inches; below this depth moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills, bedrock floored plains
Parent material: Residuum from igneous rocks
Slope range: 2 to 60 percent

Annual precipitation: 15 to 19 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Coarse-loamy, mixed Typic Haploborolls

Typical Pedon

Belain loam, in an area of Hedoes-Belain loams, 8 to 25 percent slopes, in hayland, 2,600 feet west and 2,400 feet south of the northeast corner of sec. 24, T. 27 N., R. 15 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; strong fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine and very fine roots; neutral; abrupt smooth boundary.

Bw1—6 to 13 inches; dark brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; many very fine tubular pores; neutral; clear wavy boundary.

Bw2—13 to 18 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; many very fine tubular pores; neutral; gradual wavy boundary.

Bk—18 to 26 inches; grayish brown (10YR 5/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular structure; slightly hard, very friable, nonsticky and nonplastic; 20 percent pebbles; few fine masses of lime; slightly effervescent; mildly alkaline.

R—26 inches; dark basic igneous bedrock; weathered in upper 5 inches.

Range in Characteristics

Mollic epipedon thickness: 10 to 16 inches
Content of clay in the control section: 10 to 18 percent
Rock fragments in the control section: 15 to 35 percent
Depth to bedrock: 20 to 40 inches

A horizon

Hue: 7.5YR, 10YR, or 2.5Y
Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3
 Texture: loam or sandy loam
 Clay content: 5 to 20 percent
 Rock fragments: 0 to 20 percent—0 to 10 percent
 cobbles, 0 to 10 percent pebbles
 Reaction: pH 6.1 to 7.8

Bw horizons

Hue: 7.5YR, 10YR, or 2.5Y
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2, 3, or 4
 Clay content: 10 to 18 percent
 Texture: sandy loam or loam
 Rock fragments: 0 to 35 percent—0 to 5 percent
 cobbles, 0 to 35 percent pebbles
 Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 7.5YR, 10YR, or 2.5Y
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2, 3, or 4
 Texture: loam or sandy loam
 Rock fragments: 15 to 45 percent—0 to 5 percent
 cobbles, 15 to 40 percent pebbles
 Lime coats or casts: few to common, faint to
 prominent
 Calcium carbonate equivalent: 1 to 10 percent
 Reaction: pH 7.4 to 8.4

916C—Belain-Hedoes sandy loams, 2 to 8 percent slopes

Setting

Landform:

- * Belain—Bedrock-floored plains
- * Hedoes—Alluvial fans

Position on landform:

- * Belain—Backslopes and shoulders
- * Hedoes—Footslopes

Slope:

- * Belain—2 to 8 percent
- * Hedoes—2 to 8 percent

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Belain and similar soils: 55 percent
 Hedoes and similar soils: 30 percent

Minor Components

Sandy soils shallow to bedrock: 0 to 7 percent
 Perma and similar soils: 0 to 3 percent
 Loamy sand surface layers: 0 to 3 percent
 Areas of rock outcrop: 0 to 2 percent

Major Component Description

Belain

Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

Hedoes

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

895F—Belain-Whitlash, moist-Hedoes complex, 15 to 60 percent slopes

Setting

Landform:

- * Belain—Hills
- * Whitlash—Hills
- * Hedoes—Hills

Position on landform:

- * Belain—Backslopes
- * Whitlash—Shoulders and summits
- * Hedoes—Footslopes

Slope:

- * Belain—25 to 60 percent
- * Whitlash—25 to 60 percent
- * Hedoes—15 to 45 percent

Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Belain and similar soils: 35 percent
 Whitlash and similar soils: 30 percent
 Hedoes and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 5 percent
 Perma and similar soils: 0 to 3 percent
 Belain soils, forested: 0 to 3 percent
 Hedoes soils, forested: 0 to 2 percent
 Soils very shallow to bedrock: 0 to 2 percent

Major Component Description

Belain

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches

Whitlash

Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 1.5 inches

Hedoes

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

911F—Belain-Whitlash-Hedoes complex, 15 to 45 percent slopes

Setting

Landform:

- * Belain—Hills
- * Whitlash—Hills
- * Hedoes—Hills

Position on landform:

- * Belain—Backslopes
- * Whitlash—Shoulders and summits
- * Hedoes—Footslopes

Slope:

- * Belain—15 to 45 percent
- * Whitlash—15 to 45 percent
- * Hedoes—15 to 45 percent

Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Belain and similar soils: 45 percent
 Whitlash and similar soils: 25 percent
 Hedoes and similar soils: 20 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent
 Perma and similar soils: 0 to 5 percent
 Slopes more than 45 percent: 0 to 2 percent

Major Component Description

Belain

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches

Whitlash

Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.5 inches

Hedoes

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

896E—Belain-Whitlash-Rock outcrop complex, 8 to 25 percent slopes**Setting***Landform:*

- * Belain—Hills
- * Whitlash—Hills
- * Rock outcrop—Hills

Position on landform:

- * Belain—Backslopes and footslopes
- * Whitlash—Shoulders and summits
- * Rock outcrop—Shoulders and summits

Slope:

- * Belain—8 to 25 percent
- * Whitlash—8 to 25 percent

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition**Major Components**

Belain and similar soils: 45 percent
 Whitlash and similar soils: 30 percent
 Rock outcrop: 15 percent

Minor Components

Perma and similar soils: 0 to 3 percent
 Slopes more than 25 percent: 0 to 3 percent
 Hedoes and similar soils: 0 to 2 percent
 Sandy loam surface layers: 0 to 2 percent

Major Component Description**Belain**

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches

Whitlash

Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.5 inches

Rock outcrop

Definition: Exposures of igneous bedrock

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Benz Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 2 to 15 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Benz clay loam, in an area of Yamacall-Benz clay loams, 2 to 8 percent slopes, in rangeland, 2,300 feet west and 500 feet south of the northeast corner of sec. 16, T. 25 N., R. 17 E.

E—0 to 2 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure with a vesicular crust 1/2-inch thick; very hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots;

common very fine vesicular and tubular pores; mildly alkaline; abrupt smooth boundary.

Bkn—2 to 4 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; few fine and very fine roots; common very fine tubular pores; few fine masses of lime; slightly effervescent; strongly alkaline; clear wavy boundary.

Bkny1—4 to 10 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine prismatic structure parting to moderate medium subangular blocky; very hard, very friable, sticky and plastic; few fine and very fine roots; many very fine tubular pores; lime disseminated; few fine masses of gypsum; strongly effervescent; strongly alkaline; clear wavy boundary.

Bkny2—10 to 28 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; very hard, very friable, slightly sticky and slightly plastic; roots present; many very fine tubular pores; common fine masses and threads of lime; few fine masses of gypsum; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bkny3—28 to 41 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; very hard, very friable, slightly sticky and slightly plastic; many very fine tubular pores; few fine masses of lime and gypsum; strongly effervescent; very strongly alkaline; clear wavy boundary.

Bkny4—41 to 60 inches; light yellowish brown (2.5Y 6/4) thick strata of fine sandy loam and silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; many very fine tubular pores; few fine masses of lime and gypsum; violently effervescent; very strongly alkaline.

Range in Characteristics

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

E horizon

Hue: 2.5Y or 10YR

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

Chroma: 2 or 3

Clay content: 18 to 27 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 4 to 13

Reaction: pH 7.4 to 9.0

Bkn and Bkny horizons

Hue: 5Y, 2.5Y, 10YR

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

Chroma: 2, 3, or 4

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

Clay content: 18 to 35 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Calcium carbonate equivalent: 5 to 15 percent

Gypsum content: 2 to 5 percent

Reaction: pH 8.5 to 9.6

Bigzag Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Poorly drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Annual precipitation: 11 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 125 days

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

Typical Pedon

Bigzag silty clay, 0 to 2 percent slopes, in rangeland, 800 feet south and 600 feet east of the northwest corner of sec. 23, T. 21 N., R 10 E.

Anyz—0 to 4 inches; olive gray (5Y 4/2) silty clay, gray (5Y 5/1) dry, moderate fine subangular blocky structure; very hard, firm, very sticky and very plastic, common fine and very fine roots, few very fine tubular pores; few fine masses of gypsum and other salts; slightly effervescent; moderately alkaline; clear smooth boundary.

Bnyzg1—4 to 15 inches; olive gray (5Y 4/2) silty clay, gray (5Y 5/1) dry; few fine distinct light olive brown (2.5Y 5/4) dry mottles; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; common fine seams and masses of gypsum and other salts; strongly effervescent; strongly alkaline; clear wavy boundary.

Bnyzg2—15 to 30 inches; dark gray (5Y 4/1) silty clay, gray (5Y 5/1) dry; common fine distinct grayish brown (2.5Y 5/2) dry mottles; weak medium subangular blocky structure; very hard, firm, very sticky and very plastic, few very fine roots, common very fine tubular pores; common fine seams and masses of gypsum and other salts; strongly effervescent; strongly alkaline; clear wavy boundary.

BCnyzg1—30 to 48 inches; olive gray (5Y 4/2) silty clay, olive gray (5Y 5/2) dry; many fine faint olive (5Y 5/3) dry mottles; massive; extremely hard, very firm, very sticky and very plastic; common very fine tubular pores; common fine seams and masses of gypsum and other salts; strongly effervescent; strongly alkaline; clear wavy boundary.

BCnyzg2—48 to 60 inches; dark gray (5Y 4/1) silty clay loam, light gray (5Y 6/1) dry; many fine faint olive (5Y 5/3) dry mottles; massive, very hard, firm, very sticky and very plastic; common very fine tubular pores; common fine seams and masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

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

Depth to seasonal high water table: 18 to 36 inches during the period from December to June

Anyz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 1 or 2

Texture: silty clay loam or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: greater than 16 mmhos/cm

Sodium adsorption ratio: 13 to 20

Reaction: pH 7.9 to 9.0

Bnyzg1 horizon

Hue: 2.5Y or 5Y

Chroma: 1 or 2

Mottles: none to common (Hue: 2.5Y; Value: 5 dry, 4 moist; Chroma: 3 or 4)

Texture: silty clay loam or silty clay

Clay content: 35 to 60 percent

Electrical conductivity: greater than 16 mmhos/cm

Sodium adsorption ratio: 20 to 40

Reaction: pH 8.5 to 9.0

Bnyzg2 and BCnyzg horizons

Hue: 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1 or 2

Mottles: common or many (Hue: 2.5Y or 5Y; Value: 5 dry, 4 moist; Chroma: 3 or 4)

Texture: silty clay loam or silty clay

Clay content: 35 to 60 percent

Electrical conductivity: greater than 16 mmhos/cm

Sodium adsorption ratio: 13 to 30, decreasing with depth

Reaction: pH 8.5 to 9.0

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

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Mean annual precipitation: 11 to 17 inches

Frost-free period: 100 to 125 days

Composition

Major Components

Bigsag and similar soils: 90 percent

Minor Components

Somewhat poorly drained soils: 0 to 5 percent

Very poorly drained soils: 0 to 3 percent

Moderately saline soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 5.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Big Sandy Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Poorly drained

Permeability: Moderately slow (0.2 to 0.6 inch/hour) to 32 inches; below this depth slow (0.06 to 0.2 inch/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Annual precipitation: 11 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 125 days

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

Typical Pedon

Big Sandy loam, 0 to 1 percent slopes, in rangeland, 1,600 feet east and 50 feet south of the northwest corner of sec. 17, T. 28 N., R. 13 E.

- A—0 to 3 inches; very dark grayish brown (2.5Y 3/2) loam, grayish brown (2.5Y 5/2) dry; moderate fine subangular blocky structure parting to strong fine and medium granular; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine and few medium roots; slightly effervescent; moderately alkaline; clear smooth boundary.
- C—3 to 11 inches; dark grayish brown (2.5Y 4/2) loam consisting of strata of silty clay loam and fine sandy loam, light brownish gray (2.5Y 6/2) dry; few fine faint olive brown (2.5Y 4/4) mottles; weak medium prismatic structure; hard, very friable to firm, sticky and plastic; many fine and very fine and few medium roots; many very fine and few fine tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- Cg1—11 to 32 inches; olive gray (5Y 4/2) loam consisting of strata of silt loam, silty clay loam and fine sandy loam; gray and light olive gray (5Y 6/1 and 6/2) dry; common fine prominent olive brown (2.5Y 4/4) mottles; massive; hard, very friable to firm, sticky and plastic; common fine and very fine roots; common very fine tubular pores; few fine masses of lime; few fine masses of gypsum and other salts in silty clay loam strata; strongly effervescent; strongly alkaline; clear wavy boundary.
- Cg2—32 to 60 inches; dark gray and olive gray (5Y 4/1 and 4/2) clay loam consisting of strata of loam,

silty clay loam, fine sand and clay, light gray and gray (5Y 6/1 and 5/1) dry; common fine prominent olive brown (2.5Y 4/4) mottles; massive; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; few fine masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

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

Depth to seasonal high water table: 12 to 24 inches

during the period from December to June

Soil phases: Saline

A horizon

Hue: 2.5Y or 10YR

Value: 3 or 4 moist

Chroma: 1 or 2

Mottles: none to few (Hue: 2.5Y; Value: 5 or 6 dry)

Clay content: 15 to 27 percent

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

Reaction: pH 7.4 to 9.0

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

Mottles: none or few (Hue: 2.5Y; Value 5 or 6 dry)

Texture: loam or silty clay loam consisting of strata of silt loam, clay loam, or fine sandy loam

Clay content: 18 to 35 percent

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

Reaction: pH 7.9 to 9.0

Cg1 horizon

Hue: 5Y or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1 or 2

Mottles: common or many (Hue: 2.5Y or 10YR;

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

Texture: loam or silty clay loam consisting of strata of silt loam, clay loam, or fine sandy loam

Clay content: 18 to 35 percent

Electrical conductivity: 4 to 25 mmhos/cm, saline phase 16 to 25 mmhos/cm

Reaction: pH 8.5 to 9.0

Cg2 horizon

Hue: 5Y or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1 or 2

Mottles: common or many (Hue: 2.5Y or 10YR; Value: 5 or 6 dry, 4 or 5 moist; Chroma: 4 or 6)
 Texture: silt loam, silty clay loam, or clay loam consisting of strata of silt loam, fine sandy loam, fine sand, loamy sand, or clay
 Clay content: 15 to 35 percent
 Electrical conductivity: 8 to 25 mmhos/cm; saline phase 16 to 25 mmhos/cm
 Reaction: pH 8.5 to 9.0

160A—Bigsandy loam, 0 to 1 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 1 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Bigsandy and similar soils: 90 percent

Minor Components

Bigsandy silty clay loam: 0 to 5 percent
 Strongly saline soils: 0 to 3 percent
 Somewhat poorly drained soils: 0 to 2 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Busby Series

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

Landform: Alluvial fans, stream terraces, hills
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Busby fine sandy loam, 4 to 8 percent slopes, in rangeland, 1,200 feet west and 150 feet south of the northeast corner of sec. 2, T. 23 N., R. 16 E.

A—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; strong fine granular structure; soft, very friable, nonsticky and nonplastic, many very fine and fine roots; mildly alkaline; clear wavy boundary.

Bw—4 to 11 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine tubular pores; slightly effervescent; mildly alkaline; clear wavy boundary.

Bk1—11 to 16 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; many very fine tubular pores; few fine seams and masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—16 to 28 inches; pale brown (10YR 6/3) fine sandy loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure; hard, very friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; common fine seams and masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BCk—28 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 10 to 18 percent
Depth to the Bk horizon: 10 to 16 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 3 or 4 moist
 Chroma: 2, 3, or 4
 Clay content: 10 to 18 percent
 Effervescence: none to slight
 Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: fine sandy loam, sandy loam, loam
 Clay content: 10 to 18 percent
 Effervescence: none to strongly
 Reaction: pH 7.4 to 8.4

Bk and B_{ck} horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 6 or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: fine sandy loam, sandy loam
 Clay content: 3 to 18 percent
 Effervescence: strongly to violently
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

94B—Busby fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Busby and similar soils: 85 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent
 Twilight and similar soils: 0 to 5 percent
 Yetull and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

94C—Busby fine sandy loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Busby and similar soils: 85 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent
 Twilight and similar soils: 0 to 5 percent
 Yetull and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

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

Setting

Landform: Alluvial fans

Slope: 8 to 15 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Busby and similar soils: 85 percent

Minor Components

Yamacall and similar soils: 0 to 5 percent

Twilight and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

941D—Busby-Twilight fine sandy loams, 4 to 15 percent slopes

Setting

Landform:

* Busby—Hills

* Twilight—Hills

Position on landform:

* Busby—Footslopes

* Twilight—Backslopes and shoulders

Slope:

* Busby—4 to 15 percent

* Twilight—8 to 15 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Busby and similar soils: 60 percent

Twilight and similar soils: 25 percent

Minor Components

Fleak and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 3 percent

Slopes more than 15 percent: 0 to 3 percent

Benz and similar soils: 0 to 2 percent

Areas of rock outcrop: 0 to 2 percent

Major Component Description

Busby

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.7 inches

Twilight

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Cabba Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Hills, escarpments

Parent material: Residuum from interbedded sandstone and shale

Slope range: 15 to 70 percent

Annual precipitation: 14 to 19 inches

Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 120 days

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

Typical Pedon

Cabba loam, in an area of Shambo-Amor-Cabba loams, 15 to 60 percent slopes, in rangeland, 2,100 feet north and 1,000 feet east of the southwest corner of sec. 15, T. 21 N., R. 9 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

BK1—3 to 8 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; common fine masses of lime; strongly effervescent; mildly alkaline; clear wavy boundary.

BK2—8 to 15 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; strong thin platy structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine pores; common fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—15 to 60 inches; pale brown (10YR 6/3) interbedded sandstone and shale, brown (10YR 5/3) moist; few very fine and fine roots in vertical cracks in upper part; strongly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 20 to 35 percent
Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 3, 4, 5, or 6 dry; 3 or 4 moist
 Chroma: 1, 2, 3, or 4
 Clay content: 20 to 27 percent
 Rock fragments: 0 to 60 percent—0 to 40 percent stones, cobbles, boulders; 0 to 30 percent pebbles or channers
 Electrical conductivity: 0 to 4 mmhos/cm

Effervescence: slightly to violently
 Reaction: pH 7.4 to 9.0

Bk horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, 7, or 8 dry; 4, 5, 6, or 7 moist
 Chroma: 1, 2, 3, 4, or 6
 Texture: loam, silt loam, clay loam, or silty clay loam
 Clay content: 20 to 35 percent
 Rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles or channers
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 0 to 8 mmhos/cm
 Reaction: pH 7.4 to 9.0

965F—Cabba-Macar loams, 15 to 60 percent slopes

Setting

Landform:

- * Cabba—Escarpments
- * Macar—Hills

Position on landform:

- * Cabba—Backslopes and shoulders
- * Macar—Footslopes

Slope:

- * Cabba—15 to 60 percent
- * Macar—15 to 35 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

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

Minor Components

Areas of rock outcrop: 0 to 3 percent
 Sagedale and similar soils: 0 to 3 percent
 Vebar and similar soils: 0 to 3 percent
 Wayden and similar soils: 0 to 3 percent
 Cohagen and similar soils: 0 to 2 percent
 Whitlash and similar soils: 0 to 1 percent

Major Component Description

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

Macar

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

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

Setting

Landform:

- * Cabba—Escarpments
- * Wayden—Escarpments
- * Rock outcrop—Escarpments

Slope:

- * Cabba—25 to 70 percent
- * Wayden—25 to 70 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Cabba and similar soils: 35 percent

Wayden and similar soils: 30 percent
 Rock outcrop: 20 percent

Minor Components

Amor and similar soils: 0 to 3 percent
 Macar and similar soils: 0 to 3 percent
 Vebar and similar soils: 0 to 3 percent

Sagedale and similar soils: 0 to 2 percent
 Cohagen and similar soils: 0 to 2 percent
 Soils with loamy sand profiles: 0 to 2 percent

Major Component Description

Cabba

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

Wayden

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

Rock outcrop

Definition: Exposures of sandstone or shale bedrock

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Cabbart Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains, hills, escarpments
Parent material: Residuum from interbedded sandstone and shale
Slope range: 2 to 70 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Cabbart loam, in an area of Cabbart-Delpoint loams, 8 to 25 percent slopes, in rangeland, 850 feet east and 2,100 feet north of the southwest corner of sec. 4, T. 25 N., R. 8 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; strongly effervescent; mildly alkaline; clear smooth boundary.

Bk—4 to 18 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine pores; common fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—18 to 60 inches; light yellowish brown (2.5Y 6/4) interbedded sandstone and shale, olive brown (2.5Y 4/4) moist; slightly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 18 to 35 percent
Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 3, 4, or 5 moist
Chroma: 2, 3, or 4
Clay content: 18 to 27 percent
Rock fragments: 0 to 15 percent hard fragments—
0 to 5 percent cobbles, 0 to 10 percent pebbles
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.4 to 9.0

Bk horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: loam, clay loam, silt loam, silty clay loam
Clay content: 18 to 35 percent
Rock fragments: 0 to 45 percent—0 to 15 percent
hard pebbles, 0 to 45 percent soft pebbles
Electrical conductivity: 2 to 8 mmhos/cm
Calcium carbonate equivalent: 15 to 25 percent
Reaction: pH 7.4 to 9.0

21E—Cabbart-Delpoint loams, 8 to 25 percent slopes

Setting

Landform:

- * Cabbart—Hills
- * Delpoint—Hills

Position on landform:

- * Cabbart—Backslopes and shoulders
- * Delpoint—Backslopes and footslopes

Slope:

- * Cabbart—8 to 25 percent
- * Delpoint—8 to 25 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Yamacall and similar soils: 0 to 5 percent
Busby and similar soils: 0 to 3 percent
Twilight and similar soils: 0 to 3 percent
Fleak and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.1 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

212F—Cabbart-Hillon loams, 25 to 70 percent slopes

Setting

Landform:

- * Cabbart—Escarpments
- * Hillon—Escarpments

Position on landform:

- * Cabbart—Backslopes and footslopes
- * Hillon—Backslopes and shoulders

Slope:

- * Cabbart—25 to 70 percent
- * Hillon—25 to 70 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Cabbart and similar soils: 55 percent
Hillon and similar soils: 30 percent

Minor Components

Twilight and similar soils: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Fleak and similar soils: 0 to 3 percent
Forested soils (eastern part): 0 to 2 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Hillon

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

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

Setting

Landform:

- * Cabbart—Escarpments
- * Yawdim—Escarpments
- * Rock outcrop—Escarpments

Slope:

- * Cabbart—25 to 70 percent
- * Yawdim—25 to 70 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Cabbart and similar soils: 35 percent
Yawdim and similar soils: 30 percent
Rock outcrop: 20 percent

Minor Components

Twilight and similar soils: 0 to 3 percent
Neldore and similar soils: 0 to 3 percent
Deep and very deep soils: 0 to 3 percent
Fleak and similar soils: 0 to 2 percent
Bascovy and similar soils: 0 to 2 percent
Moderately saline soils: 0 to 2 percent

Major Component Description

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Yawdim

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.7 inches

Rock outcrop

Definition: Exposures of sandstone or shale bedrock

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Chinook Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

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

Landform: Alluvial fans, stream terraces, small drainageways, till plains

Parent material: Alluvium, eolian deposits, glaciofluvial deposits

Slope range: 0 to 10 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy, mixed Aridic Haploborolls

Typical Pedon

Chinook fine sandy loam, 0 to 4 percent slopes, in cropland, 500 feet north and 2,200 feet west of the southeast corner of sec. 10, T. 25 N., R. 7 E.

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; mildly alkaline; abrupt smooth boundary.

Bw—5 to 12 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; common fine roots; many very fine and few fine tubular pores; mildly alkaline; clear wavy boundary.

Bk1—12 to 24 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine and few fine tubular pores; lime disseminated and few fine masses; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—24 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; lime disseminated; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches

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

Depth to the Bk horizon: 10 to 24 inches

A horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Texture: loam or fine sandy loam

Clay content: 5 to 20 percent

Rock fragments: 0 to 35 percent pebbles

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: fine sandy loam or sandy loam

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

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: fine sandy loam or sandy loam

Clay content: 5 to 15 percent and more than 50 percent medium, fine, and coarser sand

Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 3 to 15 percent
 Reaction: pH 6.6 to 9.0

Bk2 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: fine sandy loam or sandy loam
 Clay content: 5 to 15 percent and more than 50 percent medium, fine, and coarser sand
 Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent—few and common masses and threads of lime
 Reaction: pH 6.6 to 9.0

36B—Chinook fine sandy loam, 0 to 4 percent slopes**Setting**

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Chinook and similar soils: 85 percent

Minor Components

Cozberg and similar soils: 0 to 5 percent
 Fortbenton and similar soils: 0 to 5 percent
 Lihen and similar soils: 0 to 3 percent
 Evanston and similar soils: 0 to 2 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

36C—Chinook fine sandy loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 4 to 8 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Chinook and similar soils: 85 percent

Minor Components

Cozberg and similar soils: 0 to 5 percent
 Fortbenton and similar soils: 0 to 5 percent
 Lihen and similar soils: 0 to 3 percent
 Slopes more than 8 percent: 0 to 2 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

364B—Chinook loam, 0 to 4 percent slopes**Setting**

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Chinook and similar soils: 85 percent

Minor Components

Kremlin and similar soils: 0 to 5 percent
 Cozberg and similar soils: 0 to 3 percent
 Lihen and similar soils: 0 to 3 percent
 Chinook fine sandy loam: 0 to 2 percent
 Fortbenton and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

364C—Chinook loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 4 to 8 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Chinook and similar soils: 85 percent

Minor Components

Kremlin and similar soils: 0 to 5 percent
 Chinook fine sandy loam: 0 to 5 percent
 Cozberg and similar soils: 0 to 3 percent
 Lihen and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

363C—Chinook-Lihen fine sandy loams, 2 to 10 percent slopes**Setting**

Landform:
 * Chinook—Stream terraces
 * Lihen—Sand dunes
Position on landform:
 * Chinook—Backslopes and footslopes
 * Lihen—Backslopes and shoulders
Slope:
 * Chinook—2 to 10 percent
 * Lihen—2 to 10 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

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

Minor Components

Lihen loamy fine sand: 0 to 5 percent
 Yetull and similar soils: 0 to 5 percent
 Fortbenton and similar soils: 0 to 3 percent
 Kremlin and similar soils: 0 to 2 percent

Major Component Description**Chinook**

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

Lihen

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

362C—Chinook-Yetull complex, 2 to 10 percent slopes**Setting***Landform:*

- * Chinook—Stream terraces
- * Yetull—Sand dunes

Position on landform:

- * Chinook—Backslopes and footslopes
- * Yetull—Backslopes and shoulders

Slope:

- * Chinook—2 to 10 percent
- * Yetull—2 to 10 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Chinook and similar soils: 45 percent
 Yetull and similar soils: 40 percent

Minor Components

Fortbenton and similar soils: 0 to 5 percent
 Lonesome and similar soils: 0 to 5 percent
 Cozberg and similar soils: 0 to 3 percent
 Kenilworth and similar soils: 0 to 2 percent

Major Component Description**Chinook**

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.4 inches

Yetull

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Eolian deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Cohagen Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

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

Landform: Hills

Parent material: Residuum from sandstone

Slope range: 25 to 60 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

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

Typical Pedon

Cohagen fine sandy loam, in an area of Tally-Cohagen fine sandy loams, 25 to 60 percent slopes, in rangeland, 1,200 feet south and 2,400 feet east of the northwest corner of sec. 6, T. 20 N., R. 13 E.

A—0 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine, and common medium roots; mildly alkaline; clear wavy boundary.

C—4 to 15 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak fine subangular

blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium roots; common very fine and fine tubular and irregular pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Cr1—15 to 20 inches; pale brown (10YR 6/3) sandstone with thin lenses of shale, yellowish brown (10YR 5/4) moist; common fine roots matted along plates; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Cr2—20 to 60 inches; light gray (10YR 7/2) sandstone, pale brown (10YR 6/3) moist; mildly alkaline.

Range in Characteristics

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

Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Clay content: 10 to 18 percent

Reaction: pH 7.4 to 7.8

C horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: fine sandy loam, sandy loam

Clay content: 10 to 18 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 7.4 to 8.4

Cozberg Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderately rapid (2.0 to 6.0 inches/hour) to 34 inches; below this depth rapid (6.0 to 20.0 inches/hour)

Landform: Stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Coarse-loamy, mixed Aridic Haploborolls

Typical Pedon

Cozberg fine sandy loam, in an area of Cozberg-

Chinook fine sandy loams, 0 to 4 percent slopes, in rangeland, 1,500 feet east and 2,200 feet north of the southwest corner of sec. 33, T. 29 N., R. 13 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; neutral, clear smooth boundary.

Bw—6 to 17 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and few fine tubular pores; neutral; clear wavy boundary.

Bk1—17 to 22 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and few fine tubular pores; common fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—22 to 34 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine tubular pores; many fine masses and seams of lime; strongly effervescent; moderately alkaline; abrupt wavy boundary.

2C—34 to 60 inches; light brownish gray (2.5Y 6/2) sand and coarse sand, grayish brown (2.5Y 5/2) moist; single grain; loose, nonsticky and nonplastic; many fine irregular pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 14 inches

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

Depth to the Bk horizon: 16 to 28 inches

Depth to the 2C horizon: 20 to 40 inches

A horizon

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Value: 3 or 4 moist
 Chroma: 2 or 3
 Texture: fine sandy loam, very fine sandy loam, sandy loam
 Clay content: 10 to 18 percent
 Rock fragments: 0 to 15 percent
 Reaction: pH 6.6 to 7.8

Bk horizons

Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: fine sandy loam, sandy loam, very fine sandy loam
 Clay content: 10 to 18 percent
 Rock fragments: 0 to 15 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 6.6 to 7.8

2C horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loamy sand, sand, loamy coarse sand, coarse sand
 Clay content: 0 to 10 percent
 Rock fragments: 0 to 35 percent pebbles
 Reaction: pH 7.4 to 8.4

363B—Cozberg-Chinook fine sandy loams, 0 to 4 percent slopes

Setting

Landform:

- * Cozberg—Stream terraces
- * Chinook—Stream terraces

Slope:

- * Cozberg—0 to 4 percent
- * Chinook—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Lihen and similar soils: 0 to 5 percent
 Fortbenton and similar soils: 0 to 5 percent
 Degrand and similar soils: 0 to 3 percent
 Kremlin and similar soils: 0 to 2 percent

Major Component Description

Cozberg

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.2 inches

Chinook

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Creed Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans, stream terraces, small drainageways
Parent material: Alluvium, glaciofluvial deposits
Slope range: 0 to 8 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Creed loam, in an area of Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes, in rangeland, 900 feet south and 1,400 feet west of the northeast corner of sec. 20, T. 27 N., R. 5 E.

A—0 to 2 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky

and slightly plastic; many very fine and fine roots; neutral; clear smooth boundary.

E—2 to 6 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; neutral; clear smooth boundary.

Bt—6 to 12 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; strong fine columnar structure parting to strong fine subangular blocky; very hard, firm, sticky and plastic; many fine roots; common very fine tubular pores; many distinct clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bkn—12 to 26 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very hard, friable, sticky and plastic; common fine roots; common very fine tubular pores; common fine and medium masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bkny—26 to 46 inches; grayish brown (2.5Y 5/2) silty clay loam; dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; many fine seams and medium masses of gypsum; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BCny—46 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam; olive brown (2.5Y 4/4) moist; massive; hard, friable, sticky and plastic; common very fine tubular pores; few fine masses of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

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

Depth to the Bkn horizon: 10 to 20 inches

Depth to the Bkny horizon: 22 to 36 inches

A horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Reaction: pH 6.6 to 8.4

E horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: loam, sandy loam, sandy clay loam, clay loam, silty clay loam

Clay content: 20 to 35 percent

Reaction: pH 6.6 to 8.4

Bt horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: clay loam, silty clay loam, clay, silty clay

Clay content: 35 to 55 percent

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 8 to 13

Bkn, Bkny, Bky, and BCny horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: silty clay loam, clay loam, sandy clay loam, loam, clay

Clay content: 25 to 40 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 25

Gypsum content: 0 to 2 percent

Reaction: pH 7.9 to 9.0

Crow Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Mountains

Parent material: Slope alluvium from shale

Slope range: 8 to 25 percent

Annual precipitation: 18 to 22 inches

Annual air temperature: 40 to 43 degrees F

Frost-free period: 70 to 100 days

Taxonomic Class: Fine, mixed Glossic Eutroboralfs

Typical Pedon

Crow loam, in an area of Crow-Lubrecht loams, 8 to 35 percent slopes, in forest, 900 feet east and 900 feet south of the northwest corner of sec. 16, T. 28 N., R. 15 E.

O—2 inches to 0; slightly decomposed forest litter.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong medium granular and moderate fine subangular

blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; 5 percent pebbles; slightly acid; clear smooth boundary.

E—4 to 12 inches; light gray and light brownish gray (10YR 7/2) and (10YR 6/2) loam, grayish brown (10YR 5/2) moist; strong fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; 5 percent pebbles; slightly acid; clear smooth boundary.

E/Bt—12 to 17 inches; E part (60 percent) is light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; the B part (40 percent) is grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong fine and medium subangular blocky structure; hard, friable, sticky and plastic; common fine and medium roots; many very fine and fine tubular pores; 5 percent pebbles; neutral; gradual wavy boundary.

Bt1—17 to 30 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; extremely hard, firm, sticky and very plastic; common very fine and fine roots; common very fine tubular pores; many faint clay films and unstained sand grains on faces of peds; interfingering of E material into upper 6 inches; 5 percent pebbles; neutral; gradual wavy boundary.

Bt2—30 to 45 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; few fine roots; common very fine tubular pores; common faint clay films and unstained sand grains on faces of peds; 5 percent pebbles; neutral; gradual wavy boundary.

BC—45 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, friable, sticky and plastic; few fine roots; common very fine tubular pores; 5 percent pebbles; neutral.

Range in Characteristics

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

A horizon

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

Clay content: 20 to 27 percent
Rock fragments: 0 to 25 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles
Reaction: pH 5.6 to 6.5

E horizon

Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 20 to 27 percent
Rock fragments: 0 to 25 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles
Reaction: pH 5.6 to 6.5

E/Bt horizon

Hue: 10YR or 2.5Y
Value: E part 6, 7, or 8, B part 5 or 6 dry; E part 5 or 6, B part 4 or 5 moist
Chroma: E part 2 or 3, B part 2, 3, or 4
Texture, mixed: silty clay loam, clay loam, loam, silt loam
Clay content, mixed: 20 to 40 percent
Rock fragments: 0 to 25 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles
Reaction: pH 6.1 to 7.3

Bt1 and Bt2 horizons

Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 2, 3, or 4
Texture: silty clay, clay, sandy clay, clay loam
Clay content: 35 to 60 percent
Rock fragments: 0 to 35 percent—0 to 10 percent cobbles, 0 to 25 percent pebbles
Reaction: pH 6.1 to 7.3

BC horizon

Hue: 2.5Y, 10YR, or 7.5YR
Value: 6 or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: sandy clay loam, clay loam, loam, sandy loam
Clay content: 20 to 35 percent
Rock fragments: 5 to 35 percent—0 to 10 percent cobbles, 5 to 25 percent pebbles
Reaction: pH 6.1 to 7.3

630E—Crow-Lubrecht loams, 8 to 35 percent slopes

Setting

Landform:

* Crow—Mountains
* Lubrecht—Mountains

Position on landform:

- * Crow—Foothills
- * Lubrecht—Backslopes and shoulders

Slope:

- * Crow—8 to 25 percent
- * Lubrecht—8 to 35 percent

Mean annual precipitation: 18 to 22 inches*Frost-free period:* 70 to 100 days**Composition****Major Components**

Crow and similar soils: 45 percent
 Lubrecht and similar soils: 40 percent

Minor Components

Ambrant and similar soils: 0 to 5 percent
 Belain and similar soils: 0 to 5 percent
 Winkler and similar soils: 0 to 3 percent
 Soils with quaking aspen trees: 0 to 2 percent

Major Component Description**Crow***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 9.3 inches**Lubrecht***Surface layer texture:* Loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Shale residuum*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 5.5 inches**Management**

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Daglum Series*Depth class:* Very deep (greater than 60 inches)*Drainage class:* Well drained*Permeability:* Slow (0.06 to 0.2 inch/hour)*Landform:* Glaciated till plains, stream terraces, drainageways*Parent material:* Alluvial fans, glaciofluvial deposits, glacial till*Slope range:* 0 to 2 percent*Annual precipitation:* 14 to 17 inches*Annual air temperature:* 42 to 45 degrees F*Frost-free period:* 100 to 120 days

Taxonomic Class: Fine, montmorillonitic Vertic
 Natriborolls

Typical Pedon

Daglum loam, in an area of Bearpaw-Daglum complex, 0 to 2 percent slopes, in cropland, 2,600 feet north and 2,350 feet west of the southeast corner of sec. 36, T. 23 N., R. 13 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to strong medium granular; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; abrupt smooth boundary.

E—7 to 12 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderately thick platy; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine tubular pores; mildly alkaline; abrupt smooth boundary.

Bt—12 to 20 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; strong fine and medium columnar structure parting to strong medium subangular blocky in the lower part; very hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; many distinct clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Bkn—20 to 30 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkny—30 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist;

moderate medium subangular blocky structure; hard, very firm, sticky and plastic; few very fine roots; many very fine tubular pores; common fine masses of lime; few fine masses of gypsum; violently effervescent; strongly alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 10 inches

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

Depth to seasonal water table: Moderately wet phase
48 to 72 inches

Depth to the Bk horizon: 12 to 20 inches

Depth to the Bkny horizon: 16 to 30 inches

Soil phases: Moderately wet

A horizon

Hue: 10YR

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

Chroma: 2

Clay content: 18 to 27 percent

Reaction: pH 6.1 to 7.8

E horizon

Hue: 10YR or 2.5Y

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

Chroma: 1 or 2

Clay content: 20 to 27 percent

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: clay, silty clay, silty clay loam, clay loam

Clay content: 35 to 60 percent

Reaction: pH 6.6 to 9.0

Some pedons have gypsum accumulation in the B and C horizons; some pedons have a Bk horizon

Bkn and Bkny horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, 3, or 4

Texture: clay loam, silty clay, silty clay loam, clay

Reaction: pH 7.9 to 9.0, slightly alkaline to strongly alkaline

Degrad Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to 28 inches; below this depth rapid (6.0 to 20.0 inches/hour)

Landform: Stream terraces, alluvial fans, small drainageways

Parent material: Glaciofluvial deposits

Slope range: 0 to 4 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

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

Typical Pedon

Degrad loam, 0 to 4 percent slopes, in cropland, 2,450 feet south and 1,100 feet west of the northeast corner of sec. 31, T. 25 N., R. 6 E.

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

Bt—6 to 11 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores; common thin brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

Bk1—11 to 20 inches; light brownish gray (10YR 6/2) and light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores; many medium and coarse masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—20 to 28 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate fine and medium subangular blocky structure; hard, very friable, sticky and plastic; few very fine roots; many very fine tubular pores; violently effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

2C1—28 to 40 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine irregular pores; 5 percent

pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C2—40 to 60 inches; grayish brown (10YR 5/2) sand and coarse sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine irregular pores; 10 percent pebbles; slightly effervescent; mildly alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches, may include part or all of the Bt horizon

Depth to the Bk horizon: 10 to 16 inches

Depth to the 2C horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Rock fragments: 0 to 15 percent—0 to 5 percent

cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: clay loam, sandy clay loam

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

Rock fragments: 0 to 15 percent—0 to 5 percent

cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: sandy clay loam, loam, or clay loam

Clay content: 15 to 30 percent

Rock fragments: 0 to 15 percent—0 to 5 percent

cobbles, 0 to 10 percent pebbles

Electrical conductivity: less than 4 mmhos/cm

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.4 to 8.4

2C horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: sand, coarse sand, fine sand, loamy sand

Clay content: 0 to 5 percent

Rock fragments: 0 to 35 percent—0 to 5 percent

cobbles, 0 to 30 percent pebbles

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.4 to 8.4

16B—Degrand loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Degrand and similar soils: 85 percent

Minor Components

Evanston and similar soils: 0 to 5 percent

Cozberg and similar soils: 0 to 5 percent

Tinsley and similar soils: 0 to 3 percent

Chinook and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Delpoint Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Sedimentary plains, hills

Parent material: Residuum from interbedded sandstone and shale

Slope range: 0 to 25 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

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

Typical Pedon

Delpoint loam, in an area of Cabbart-Delpoint loams, 8 to 25 percent slopes, in rangeland, 2,000 feet north and 800 feet east of the southwest corner of sec. 4, T. 25 N., R. 8 E.

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

Bw—4 to 12 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—12 to 16 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate fine subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine tubular pores; common fine seams and masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bk2—16 to 30 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak fine subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; common fine seams and masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—30 to 60 inches; light brownish gray and light yellowish brown (2.5Y 6/2 and 6/4) interbedded sandstone and shale, light olive (2.5Y 5/4) moist; slightly effervescent; moderately alkaline.

Range in Characteristics

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

Depth to the Bk horizon: 10 to 16 inches

Depth to the Cr horizon: 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

Clay content: 18 to 27 percent
Rock fragments: 0 to 5 percent pebbles
Effervescence: none to strongly
Reaction: pH 7.4 to 8.4

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, silty clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: none to violently

Reaction: pH 7.9 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam, sandy loam, clay loam, silty clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Effervescence: strongly or violently

Reaction: pH 7.9 to 8.4

17B—Delpoint loam, 0 to 4 percent slopes

Setting

Landform: Sedimentary plains

Slope: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Delpoint and similar soils: 85 percent

Minor Components

Cabbart and similar soils: 0 to 5 percent

Yamacall, calcareous soils: 0 to 5 percent

Yamacall and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

171C—Delpoint-Cabbart loams, 2 to 8 percent slopes

Setting

Landform:

- * Delpoint—Sedimentary plains
- * Cabbart—Sedimentary plains

Position on landform:

- * Delpoint—Backslopes and footslopes
- * Cabbart—Backslopes and shoulders

Slope:

- * Delpoint—2 to 8 percent
- * Cabbart—2 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Yamacall and similar soils: 0 to 5 percent
Twilight and similar soils: 0 to 5 percent
Fleak and similar soils: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

DA—Denied access

Composition

Major Components

Denied access: 100 percent

Major Component Description

Definition: Areas where mapping access was denied by landowner

Eaglecreek Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Hills

Parent material: Residuum from igneous rocks

Slope range: 25 to 45 percent

Annual precipitation: 18 to 24 inches

Annual air temperature: 40 to 43 degrees F

Frost-free period: 70 to 100 days

Taxonomic Class: Fine-loamy, mixed Mollic Eutroboralfs

Typical Pedon

Eaglecreek loam, in an area of Lacey Creek-Eaglecreek loams, 15 to 45 percent slopes, in woodland, 1,400 feet north and 2,500 feet east of the southwest corner of sec. 1, T. 27 N., R. 15 E.

Oi—1 inch to 0; partly decomposed needles and twigs.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak thin platy structure parting to strong fine granular; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine and few medium and coarse roots; 10 percent pebbles; slightly acid; abrupt wavy boundary.

E—4 to 10 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure parting to strong fine and medium granular; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine and few medium and coarse roots; many very fine tubular pores; 10 percent pebbles; slightly acid; clear wavy boundary.

Bt1—10 to 18 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; strong medium subangular blocky structure; very hard, friable, sticky and plastic; common fine and very fine and few medium and coarse roots; many very fine tubular pores; many distinct clay films on faces of peds; few skeletons on faces of peds in upper 3 inches; 10 percent pebbles; slightly acid; clear wavy boundary.

Bt2—18 to 32 inches; grayish brown (10YR 5/2) gravelly sandy clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, very friable, sticky and slightly plastic; common fine and very fine and few medium roots; many very fine tubular pores; common faint clay films on faces of peds and bridging sand grains; 20 percent pebbles; neutral; clear wavy boundary.

R—32 inches; hard igneous bedrock.

Range in Characteristics

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

Rock fragments in the control section: 5 to 25 percent

Depth to bedrock: 20 to 40 inches

Depth to the Bt1 horizon: 6 to 10 inches

A horizon

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1 or 2

Clay content: 12 to 22 percent

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

Reaction: pH 6.1 to 6.5

E horizon

Hue: 10YR or 7.5YR

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

Texture: loam, sandy loam

Clay content: 10 to 18 percent

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

Reaction: pH 6.1 to 6.5

Bt horizons

Hue: 10YR, 7.5YR, or 5YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: loam, clay loam, sandy clay loam

Clay content: 18 to 35 percent

Rock fragments: 5 to 25 percent—0 to 5 percent cobbles, 5 to 20 percent pebbles

Reaction: pH 6.1 to 7.3

Eagleton Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Poorly drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Fine-loamy, mixed, frigid Cumulic Endoaquolls

Typical Pedon

Eagleton loam, in an area of Enbar-Straw-Eagleton loams, 0 to 2 percent slopes, in hayland, 1,900 feet west and 1,100 feet south of the northeast corner of sec. 18, T. 27., R. 17 E.

Ap—0 to 6 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; few fine distinct dark yellowish brown (10YR 4/4) mottles; strong medium and coarse granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine and common medium roots; neutral; abrupt smooth boundary.

A2—6 to 19 inches; very dark grayish brown (10YR 3/2) loam with thin strata of fine sandy loam and clay loam, grayish brown (10YR 5/2) dry; common fine distinct dark yellowish brown (10YR 4/4)

mottles; weak fine subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common fine and very fine and few medium roots; common very fine tubular pores; neutral; clear wavy boundary.

A3—19 to 38 inches; very dark grayish brown (10YR 3/2) loam with thin strata of fine sandy loam and clay loam, dark grayish brown (10YR 4/2) dry; common fine and medium distinct dark yellowish brown (10YR 4/6) mottles; weak fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots; common very fine tubular pores; mildly alkaline; clear wavy boundary.

Cg—38 to 60 inches; black (5Y 2.5/1) loam with strata of silty clay loam, dark gray (5Y 4/1) dry; massive; hard, friable, slightly sticky and slightly plastic; common very fine tubular pores; neutral.

Range in Characteristics

Mollic epipedon thickness: 24 to 60 inches

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

Depth to seasonal high water table: 12 to 24 inches

Ap horizon

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

Mottles: none or few (Hue: 10YR; Value: 5 or 6 dry, 4 moist; Chroma: 4 or 6)

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 7.8

A2 horizon

Hue: 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 1 or 2

Mottles: few or common (Hue: 10YR; Value: 5 or 6 dry, 4 moist; Chroma: 4 or 6)

Texture: loam, clay loam, or silty clay loam consisting of thin layers of sandy loam, fine sandy loam, sandy clay loam, or clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 7.8

A3 horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 or 5 dry, 3 moist

Chroma: 1 or 2

Mottles: common or many (Hue: 10YR; Value: 5 or 6 dry, 4 moist; Chroma: 4, 6, or 8)

Texture: loam or clay loam consisting of thin layers of sandy loam, fine sandy loam, sandy clay loam, or clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 7.8

Cg horizon

Hue: 5Y, N

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

Chroma: 1 or 0

Mottles: none to common (Hue: 10YR; Value: 5 or 6 dry, 4 moist; Chroma: 4 or 6)

Texture: loam or clay loam consisting of thin layers of sandy loam, fine sandy loam, sandy clay loam, clay loam, or silty clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 7.8

Elkner Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat excessively drained

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

Landform: Mountains

Parent material: Residuum or colluvium from igneous rocks

Slope range: 25 to 45 percent

Annual precipitation: 20 to 28 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 50 to 70 days

Taxonomic Class: Coarse-loamy, mixed Typic Cryochrepts

Typical Pedon

Elkner sandy loam, in an area of Garlet-Elkner complex, 25 to 70 percent slopes, in forest, 1,300 feet north and 25 feet west of the southeast corner of sec. 27, T. 28 N., R. 15 E.

O—3 inches to 0; slightly decomposed forest litter.

A—0 to 5 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many fine roots and common medium and coarse roots; slightly acid; clear wavy boundary.

E—5 to 15 inches; pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine subangular blocky structure parting to strong medium granular; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots and common medium and coarse roots; many very fine tubular pores; slightly acid; clear wavy boundary.

E and Bt—15 to 23 inches; E part (70 percent) is pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; B part (about 30 percent) is brown (10YR 5/3) sandy loam lamellae 1/4-inch

thick, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; many very fine tubular pores; slightly acid; gradual wavy boundary.

Bt and E—23 to 32 inches; B part (about 60 percent) is brown (10YR 5/3) discontinuous sandy loam lamellae up to 1/2-inch thick, dark brown (10YR 3/3) moist; E part (40 percent) is pale brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) moist; sandy loam mixed (E and B) texture; strong fine and medium subangular blocky structure; hard, very friable, sticky and plastic; common fine and medium roots; many very fine tubular pores; 10 percent angular pebbles; slightly acid; gradual wavy boundary.

BC1—32 to 40 inches; brown (10YR 5/3) coarse sandy loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and medium roots; many very fine tubular and irregular pores and few fine tubular and irregular pores; slightly acid; gradual wavy boundary.

BC2—40 to 60 inches; grayish brown (10YR 5/2) coarse sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine roots; many very fine tubular and irregular pores and common fine tubular and irregular pores; neutral.

Range in Characteristics

Content of clay in the control section: 5 to 10 percent

A and E horizons

Value: 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 2, 3, or 4
 Texture: sandy loam or coarse sandy loam
 Clay content: 5 to 10 percent
 Rock fragments: 0 to 35 percent—0 to 35 percent cobbles, stones, or boulders; 0 to 20 percent pebbles
 Reaction: pH 5.6 to 6.5

E and Bt, Bt and E horizons

Hue: E part 10YR, B part 10YR or 2.5Y
 Value: E part 6 or 7, B part 4 or 5 dry; E part 4 or 5, B part 4 or 5 moist
 Chroma: E part 2, 3, or 4; B part 3 or 4
 Texture: coarse sandy loam, sandy loam
 Clay content: 5 to 10 percent, lamellae has less than 3 percent increase in clay
 Rock fragments: 0 to 20 percent—0 to 15 percent

cobbles, stones, or boulders; 5 to 20 percent pebbles

Reaction: pH 5.6 to 6.5

BC horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loamy coarse sand, coarse sandy loam

Clay content: 0 to 5 percent

Structure: single grain to subangular blocky

Rock fragments: 0 to 35 percent—0 to 20 percent cobbles and stones, 5 to 20 percent pebbles

Reaction: pH 5.6 to 7.3

Elloam Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Till plains

Parent material: Glacial till

Slope range: 0 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Elloam clay loam, in an area of Kevin-Elloam clay loams, 2 to 8 percent slopes, in rangeland, 1,450 feet east and 2,340 feet south of the northwest corner of sec. 6, T. 27 N., R. 6 E.

E—0 to 3 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate thin platy structure with a vesicular crust; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine vesicular pores; neutral; abrupt smooth boundary.

Btn1—3 to 8 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong fine and medium columnar structure parting to strong fine and medium subangular blocky; extremely hard, firm, very sticky and very plastic; many very fine and fine roots; many very fine and few fine tubular pores; many faint and common distinct clay films on faces of peds; continuous light gray (10YR 7/2) skeletons on tops of columns; mildly alkaline; clear smooth boundary.

Btn2—8 to 12 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; strong fine and medium prismatic structure parting to strong fine and medium subangular blocky; extremely hard, firm, sticky and plastic; common very fine and fine roots along faces of peds; many very fine and few fine pores; many distinct clay films on faces of peds; slightly effervescent; moderately alkaline; clear wavy boundary.

Bkn—12 to 18 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; many medium masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bknyz—18 to 29 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; few medium masses of gypsum and few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bnyz—29 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few very fine tubular pores; few fine and medium masses of gypsum and other salts; slightly effervescent; moderately alkaline.

Range in Characteristics

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

Depth to the Bk horizon: 8 to 18 inches

Depth to the By horizon: 12 to 25 inches

E horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Clay content: 20 to 27 percent; 30 to 35 percent where mixed to 7 inches

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

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 7.8

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

Btn1 and Btn2 horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: clay loam, clay

Clay content: 35 to 50 percent

Structure: strong or medium columnar, prismatic, blocky

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

Sodium adsorption ratio: 8 to 25

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.4 to 9.0

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

Bkn 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, clay

Clay content: 30 to 45 percent

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

Sodium adsorption ratio: 13 to 25

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

Bknyz horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1, 2, or 3

Texture: loam, clay loam

Clay content: 25 to 40 percent

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

Sodium adsorption ratio: 13 to 25

Electrical conductivity: 8 to 16 mmhos/cm

Reaction: pH 7.9 to 9.0

Bnyz horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1, 2, or 3

Texture: loam, clay loam

Clay content: 25 to 40 percent

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

Sodium adsorption ratio: 13 to 25

Electrical conductivity: 8 to 16 mmhos/cm

Bulk density: 1.7 to 1.9 grams/cc

Reaction: pH 7.9 to 9.6

Elve Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat excessively drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Mountains
Parent material: Colluvium from igneous rocks
Slope range: 25 to 70 percent
Annual precipitation: 18 to 22 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed Typic
 Cryochrepts

Typical Pedon

Elve very cobbly loam, in an area of Elve-Rock outcrop complex, 25 to 70 percent slopes, in forest, 1,600 feet south and 1,600 feet east of the northwest corner of sec. 20, T. 20 N., R. 12 E.

Oi—2 inches to 0; slightly decomposed forest litter

E1—0 to 9 inches; brown (10YR 5/3) very cobbly loam, dark brown (10YR 4/3) moist; strong medium granular structure; soft, very friable, slightly sticky and nonplastic; many fine and medium and few coarse roots; 20 percent cobbles, 15 percent pebbles, and few stones; strongly acid; clear wavy boundary.

E2—9 to 18 inches; pale brown (10YR 6/3) very cobbly loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure parting to moderate fine granular; slightly hard, very friable, slightly sticky and nonplastic; common fine and medium and few coarse roots; many very fine tubular pores; 20 percent cobbles, 30 percent pebbles, and few stones; strongly acid; clear wavy boundary.

E3—18 to 28 inches; pale brown (10YR 6/3) extremely cobbly sandy loam, brown (10YR 5/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; common fine and medium roots; many very fine tubular pores; 25 percent cobbles, 35 percent pebbles; medium acid; gradual wavy boundary.

Bw—28 to 60 inches; grayish brown (10YR 5/2) extremely cobbly sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and nonplastic; few fine roots; many very fine tubular pores; 25 percent cobbles, 45 percent pebbles; medium acid.

Range in Characteristics

Content of clay in the control section: 10 to 20 percent
Rock fragments in the control section: 60 to 85 percent

E horizons

Hue: 7.5YR or 10YR
 Value: 6 or 7 dry, 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: loam, sandy loam
 Clay content: 10 to 20 percent
 Rock fragments: 35 to 85 percent—10 to 40 percent cobbles, 0 to 25 percent stones, 20 to 35 percent pebbles
 Reaction: pH 5.1 to 6.5
 Some pedons have an E/Bw horizon or EB horizon

Bw horizon

Hue: 7.5YR or 10YR
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2, 3, 4, or 6
 Texture: loam, sandy loam
 Clay content: 10 to 20 percent
 Rock fragments: 60 to 85 percent—35 to 40 percent cobbles and stones, 25 to 45 percent pebbles
 Reaction: pH 5.1 to 6.5

560F—Elve-Rock outcrop complex, 25 to 70 percent slopes

Setting

Landform:

- * Elve—Mountains
- * Rock outcrop—Mountains

Slope: 25 to 70 percent

Mean annual precipitation: 18 to 22 inches

Frost-free period: 50 to 70 days

Composition

Major Components

Elve and similar soils: 65 percent
 Rock outcrop: 20 percent

Minor Components

Ambrant and similar soils: 0 to 5 percent
 Soils shallow to bedrock: 0 to 3 percent
 Bouldery surface layers: 0 to 3 percent
 Moderately deep soils: 0 to 2 percent
 Slopes of 2 to 8 percent: 0 to 2 percent

Major Component Description

Elve

Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Igneous colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 2.7 inches

Rock outcrop

Definition: Exposures of igneous bedrock

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Enbar Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat poorly drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Fine-loamy, mixed Cumulic
Haploborolls

Typical Pedon

Enbar loam, in an area of Enbar-Straw-Eagleton loams, 0 to 2 percent slopes, in hayland, 1,000 feet east and 2,100 feet south of the northwest corner of sec. 27, T. 22 N., R. 9 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

A2—6 to 18 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; slightly effervescent; mildly alkaline; clear wavy boundary.

C—18 to 30 inches; grayish brown (10YR 5/2) stratified

loam and silt loam, dark grayish brown (10YR 4/2) moist; few fine faint yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cg—30 to 52 inches; gray (5Y 5/1) stratified loam and silty clay loam, dark gray (5Y 4/1) moist; common fine faint brownish yellow (10YR 6/6) mottles; massive; hard, very friable, sticky and plastic; common very fine roots; many very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline; abrupt irregular boundary.

2C—52 to 60 inches; gray (10YR 5/1) very gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; many fine and medium irregular pores; 40 percent pebbles; slightly effervescent; mildly alkaline.

Range in Characteristics

Mollic epipedon thickness: 16 to 28 inches

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

Depth to seasonal water table: 30 to 60 inches

Depth to the 2C horizon: 40 to 60 inches

Ap and A2 horizons

Hue: 5YR, 7.5YR, or 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 1, 2, 4, or 6

Clay content: 18 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: none to strongly

Reaction: pH 6.6 to 8.4

C horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1 or 2

Mottles: few to common (Hue: 10YR 5/4 or 10YR 4/4)

Texture: loam or clay loam

Clay content: 18 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Effervescence: strongly or violently

Reaction: pH 7.9 to 8.4

Cg horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 0, 1, or 2
 Mottles: few to common (Hue: 10YR 3/4, 10YR 5/6, or 10YR 6/6)
 Texture: loam with stratification of sandy loam, silty clay loam, and clay loam
 Clay content: 18 to 27 percent
 Rock fragments: 0 to 15 percent pebbles
 Effervescence: strongly or violently
 Reaction: pH 7.9 to 8.4

2C horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4 to 6 dry, 4 or 5 moist
 Chroma: 1, 2, or 3
 Mottles: few to common (Hue: 10YR 6/6 or 10YR 5/6)
 Texture: sandy loam, loamy sand
 Clay content: 5 to 18 percent
 Rock fragments: 35 to 75 percent—0 to 5 percent cobbles, 35 to 70 percent pebbles
 Effervescence: strongly or violently
 Reaction: pH 7.9 to 8.4

493A—Enbar-Straw-Eagleton loams, 0 to 2 percent slopes

Setting

Landform:

- * Enbar—Flood plains
- * Straw—Flood plains
- * Eagleton—Flood plains

Slope:

- * Enbar—0 to 2 percent
- * Straw—0 to 2 percent
- * Eagleton—0 to 2 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Enbar and similar soils: 35 percent
 Straw and similar soils: 30 percent
 Eagleton and similar soils: 20 percent

Minor Components

Nesda and similar soils: 0 to 5 percent
 Very gravelly loam soils: 0 to 3 percent
 Soils with sandy loam profiles: 0 to 3 percent
 Very gravelly sandy loam soils: 0 to 2 percent
 Slopes more than 2 percent: 0 to 2 percent

Major Component Description

Enbar

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Apparent
Available water capacity: Mainly 8.9 inches

Straw

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 10.5 inches

Eagleton

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Apparent
Available water capacity: Mainly 10.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Ethridge Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Stream terraces, lake plains
Parent material: Glaciofluvial deposits, glaciolacustrine deposits, alluvium
Slope range: 0 to 4 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Ethridge silty clay loam, in an area of Ethridge-Kobase silty clay loams, 0 to 4 percent slopes, in cropland, 25 feet north and 1,650 feet east of the southwest corner of sec. 30, T. 23 N., R. 6 E.

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

Bt—6 to 14 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Bk1—14 to 21 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; few faint clay films on faces of peds; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—21 to 32 inches; light gray (2.5Y 7/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and slightly plastic; few very fine roots; common very fine and few fine tubular pores; common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BCy—32 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam with strata of silt loam and silty clay below a depth of 42 inches, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; common very fine and few fine tubular pores; common fine masses of gypsum; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 14 inches and may include all or part of the Bt horizon

Content of clay in the control section: 35 to 45 percent
Depth to the Bk horizon: 10 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y
Value: 2 or 3 moist
Chroma: 2 or 3
Texture: clay loam, silty clay loam
Clay content: 27 to 35 percent
Rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y
Value: 3 or 4 moist
Chroma: 2, 3, or 4
Texture: clay, silty clay, clay loam, silty clay loam
Clay content: 35 to 45 percent
Rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: clay, silty clay loam, loam, clay loam, silty clay
Clay content: 30 to 45 percent
Rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

BCy horizon

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: clay loam, silty clay loam (these textures consist of strata of finer and coarser materials)
Clay content: 27 to 40 percent slopes
Rock fragments: 0 to 5 percent
Electrical conductivity: 2 to 4 mmhos/cm
Gypsum content: 1 to 3 percent
Reaction: pH 7.4 to 8.4

381B—Ethridge clay loam, 0 to 4 percent slopes

Setting

Landform: Lake plains
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Ethridge and similar soils: 85 percent

Minor Components

Evanston and similar soils: 0 to 10 percent

Kobase and similar soils: 0 to 3 percent

Loamy sand substratums: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

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

Setting

Landform: Lake plains

Slope: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ethridge and similar soils: 85 percent

Minor Components

Kobase and similar soils: 0 to 5 percent

Evanston and similar soils: 0 to 3 percent

Acel and similar soils: 0 to 3 percent

Slopes more than 4 percent: 0 to 2 percent

Gerdrum and similar soils: 0 to 1 percent

Soils with sandy substratums: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

386B—Ethridge-Evanston complex, 0 to 4 percent slopes

Setting

Landform:

* Ethridge—Stream terraces

* Evanston—Stream terraces

Position on landform:

* Ethridge—Foothills and toeslopes

* Evanston—Backslopes and shoulders

Slope:

* Ethridge—0 to 2 percent

* Evanston—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ethridge and similar soils: 45 percent

Evanston and similar soils: 40 percent

Minor Components

Kobase and similar soils: 0 to 10 percent

Degrad and similar soils: 0 to 3 percent

Chinook and similar soils: 0 to 2 percent

Major Component Description

Ethridge

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.8 inches

Evanston

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

385B—Ethridge-Kobase silty clay loams, 0 to 4 percent slopes

Setting

Landform:

* Ethridge—Lake plains

* Kobase—Lake plains

Position on landform:

* Ethridge—Foothills and toeslopes

* Kobase—Backslopes and shoulders

Slope:

* Ethridge—0 to 2 percent

* Kobase—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ethridge and similar soils: 55 percent

Kobase and similar soils: 30 percent

Minor Components

Linnet and similar soils: 0 to 5 percent

Acel and similar soils: 0 to 5 percent

Evanston and similar soils: 0 to 5 percent

Major Component Description

Ethridge

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.8 inches

Kobase

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

388A—Ethridge-Lonna silty clay loams, 0 to 2 percent slopes

Setting

Landform:

* Ethridge—Lake plains

* Lonna—Lake plains

Slope:

* Ethridge—0 to 2 percent

* Lonna—0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Ethridge and similar soils: 55 percent

Lonna and similar soils: 35 percent

Minor Components

Evanston and similar soils: 0 to 5 percent

Yamacall and similar soils: 0 to 3 percent

Slopes more than 2 percent: 0 to 2 percent

Major Component Description

Ethridge

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches

Lonna

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Evanston Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans, stream terraces, small drainageways
Parent material: Alluvium, glaciofluvial deposits
Slope range: 0 to 8 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Evanston loam, 0 to 4 percent slopes, in rangeland, 1,500 feet north and 1,600 feet west of the southeast corner of sec. 36, T. 26 N., R. 5 E.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; neutral; clear wavy boundary.

Bt—6 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; hard, friable, sticky

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

Bk1—14 to 25 inches; light yellowish brown (2.5Y 6/4) clay loam, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; common very fine roots; common very fine and few fine tubular pores; common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—25 to 48 inches; light yellowish brown (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; few very fine roots, common very fine and few fine tubular pores; many fine masses of lime and disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bck—48 to 60 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches
Content of clay in the control section: 25 to 35 percent
Depth to the Bk horizon: 8 to 16 inches

A horizon

Hue: 2.5Y through 7.5YR
 Value: 3, 4, or 5 dry; 2 or 3 moist
 Chroma: 2 or 3 dry and moist
 Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 2.5Y through 7.5YR
 Value: 3, 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2 through 4 dry and moist
 Clay content: 25 to 35 percent
 Reaction: pH 6.6 to 7.8

Bk and Bck horizons

Hue: 2.5Y through 7.5YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 3 or 4 dry and moist
 Clay content: 15 to 35 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 9.0

37B—Evanston loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Evanston and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 3 percent

Yamacall, calcareous soils: 0 to 3 percent

Degrad and similar soils: 0 to 3 percent

Evanston fine sandy loam: 0 to 2 percent

Chinook and similar soils: 0 to 2 percent

Marmarth and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

37C—Evanston loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 4 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Evanston and similar soils: 85 percent

Minor Components

Yamacall, calcareous soils: 0 to 5 percent

Ethridge and similar soils: 0 to 3 percent

Degrad and similar soils: 0 to 3 percent

Chinook and similar soils: 0 to 2 percent

Marmarth and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

377B—Evanston-Degrad loams, 0 to 4 percent slopes

Setting

Landform:

* Evanston—Stream terraces

* Degrad—Stream terraces

Position on landform:

* Evanston—Footslopes and toeslopes

* Degrad—Backslopes and shoulders

Slope:

* Evanston—0 to 4 percent

* Degrad—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Evanston and similar soils: 50 percent

Degrad and similar soils: 35 percent

Minor Components

Chinook and similar soils: 0 to 5 percent
 Cozberg and similar soils: 0 to 10 percent

Major Component Description**Evanston**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.1 inches

Degrad

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

375B—Evanston-Lonna loams, 0 to 4 percent slopes**Setting***Landform:*

- * Evanston—Stream terraces
- * Lonna—Stream terraces

Position on landform:

- * Evanston—Foothills and toeslopes
- * Lonna—Backslopes and shoulders

Slope:

- * Evanston—0 to 4 percent
- * Lonna—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Evanston and similar soils: 55 percent
 Lonna and similar soils: 30 percent

Minor Components

Evanston fine sandy loam: 0 to 10 percent
 Chinook and similar soils: 0 to 5 percent

Major Component Description**Evanston**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Lonna

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 9.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

372C—Evanston-Yamacall loams, 2 to 8 percent slopes**Setting***Landform:*

- * Evanston—Alluvial fans
- * Yamacall—Alluvial fans

Slope:

- * Evanston—2 to 8 percent
- * Yamacall—2 to 8 percent

Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Evanston and similar soils: 55 percent
 Yamacall and similar soils: 30 percent

Minor Components

Degradand and similar soils: 0 to 5 percent
 Chinook and similar soils: 0 to 5 percent
 Marmarth and similar soils: 0 to 3 percent
 Delpoint and similar soils: 0 to 2 percent

Major Component Description

Evanston

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.1 inches

Yamacall

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Farnuf Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans, stream terraces, small drainageways, hills
Parent material: Alluvium
Slope range: 0 to 15 percent

Annual precipitation: 14 to 19 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 120 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Farnuf loam, 0 to 4 percent slopes, in cropland, 1,300 feet north and 500 feet east of the southwest corner of sec. 26, T. 21 N., R. 12 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong medium granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and medium roots; neutral; abrupt smooth boundary.

Bt1—6 to 12 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium prismatic structure parting to strong medium subangular blocky; hard, friable, sticky and plastic; common fine roots; common very fine tubular pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—12 to 18 inches; grayish brown (10YR 5/2) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; hard, friable, sticky and plastic; few fine roots; many very fine tubular pores; common distinct clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk1—18 to 26 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; few fine roots; many very fine tubular pores; common fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—26 to 46 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; few fine roots; many very fine tubular pores; common fine seams and masses of lime; violently effervescent; moderately alkaline, clear wavy boundary.

Bk3—46 to 60 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak

medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; many very fine tubular pores; few fine seams and masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches and includes all or part of the Bt horizons

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

Depth to the Bk horizon: 10 to 25 inches

A horizon

Hue: 2.5Y or 10YR

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

Chroma: 2 or 3

Clay content: 15 to 27 percent

Rock fragments: 0 to 35 percent—0 to 20 percent cobbles and stones, 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizons

Hue: 2.5Y, 10YR, or 7.5YR

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

Chroma: 2, 3, or 4

Texture: loam, clay loam, silty clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Some pedons have a thin Btk horizon

Bk horizons

Hue: 2.5Y, 10YR, or 7.5YR

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

Chroma: 2, 3, or 4

Texture: fine sandy loam, loam, silt loam, silty clay loam, clay loam

Clay content: 15 to 30 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

75B—Farnuf loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 4 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Farnuf and similar soils: 85 percent

Minor Components

Savage and similar soils: 0 to 10 percent

Very gravelly substratums: 0 to 3 percent

Calcareous surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

75C—Farnuf loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 4 to 8 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Farnuf and similar soils: 85 percent

Minor Components

Savage and similar soils: 0 to 7 percent

Calcareous surface layers: 0 to 5 percent

Sandy loam substratums: 0 to 3 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

411D—Farnuf-Reeder loams, 4 to 15 percent slopes

Setting

Landform:

* Farnuf—Hills

* Reeder—Hills

Position on landform:

* Farnuf—Footslopes

* Reeder—Backslopes and shoulders

Slope:

* Farnuf—4 to 8 percent

* Reeder—8 to 15 percent

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 115 days

Composition

Major Components

Farnuf and similar soils: 50 percent

Reeder and similar soils: 40 percent

Minor Components

Cabba and similar soils: 0 to 2 percent

Tally and similar soils: 0 to 2 percent

Vebar and similar soils: 0 to 2 percent

Areas of rock outcrop: 0 to 2 percent

Cohagen and similar soils: 0 to 1 percent

Whitlash and similar soils: 0 to 1 percent

Major Component Description

Farnuf

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

Reeder

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Ferd Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Alluvial fans, stream terraces

Parent material: Alluvium, glaciofluvial deposits

Slope range: 0 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Glossic Eutroboralfs

Typical Pedon

Ferd loam, 0 to 2 percent slopes, in rangeland, 2,100 feet south and 1,200 feet east of the northwest corner of sec. 21, T. 27 N., R. 5 E.

A—0 to 3 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure parting to moderate fine granular; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; neutral; abrupt smooth boundary.

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

Bt—6 to 13 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine and medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; many very fine and fine roots; common very fine tubular pores; many faint clay films on faces of peds; neutral; clear wavy boundary.

Bk1—13 to 20 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—20 to 32 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; common fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BCk—32 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, sticky and plastic; few very fine roots; common very fine and few fine tubular pores; few fine seams of lime; strongly effervescent; strongly alkaline.

Range in Characteristics

Content of clay in the control section: 35 to 50 percent
Depth to the Bk horizon: 12 to 16 inches

A horizon

Hue: 10YR or 2.5Y
Value: 3 or 4 moist
Clay content: 20 to 27 percent
Reaction: pH 6.6 to 7.3

E/Bt horizon

Hue: 10YR or 2.5Y
Texture: loam, clay loam, silty clay loam
Clay content: 22 to 35 percent
Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry
Chroma: 2 or 3
Texture: clay loam, silty clay loam, clay
Clay content: 35 to 50 percent

Electrical conductivity: less than 2 mmhos/cm
Reaction: pH 6.6 to 8.4

Bk1 and Bk2 horizons

Hue: 10YR or 2.5Y
Value: 6 or 7 dry, 4 or 5 moist
Chroma: 2 or 3
Texture: clay loam, silty clay loam
Clay content: 27 to 40 percent
Calcium carbonate equivalent: 5 to 15 percent
Sodium adsorption ratio: 0 to 13
Electrical conductivity: 2 to 8 mmhos/cm
Reaction: pH 7.9 to 9.0

BCk horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 2, 3, or 4
Texture: clay loam, silty clay loam
Clay content: 27 to 40 percent
Calcium carbonate equivalent: 5 to 15 percent
Sodium adsorption ratio: 8 to 13
Electrical conductivity: 4 to 8 mmhos/cm
Reaction: pH 7.9 to 9.6

31A—Ferd loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Ferd and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 5 percent
Creed and similar soils: 0 to 5 percent
Gerdrum and similar soils: 0 to 3 percent
Absher and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

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

Setting

Landform:

- * Ferd—Alluvial fans and stream terraces
- * Creed—Alluvial fans and stream terraces
- * Gerdrum—Alluvial fans and stream terraces

Position on landform:

- * Ferd—Microhighs
- * Creed—Microhighs
- * Gerdrum—Microlows

Slope:

- * Ferd—0 to 4 percent
- * Creed—0 to 4 percent
- * Gerdrum—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Ethridge and similar soils: 0 to 5 percent
 Absher and similar soils: 0 to 5 percent
 Evanston and similar soils: 0 to 2 percent
 Chinook and similar soils: 0 to 2 percent
 Sandy or gravelly substratums: 0 to 1 percent

Major Component Description

Ferd

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Creed

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.5 inches

Gerdrum

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

311C—Ferd-Creed-Gerdrum complex, 4 to 8 percent slopes

Setting

Landform:

- * Ferd—Alluvial fans
- * Creed—Alluvial fans
- * Gerdrum—Alluvial fans

Position on landform:

- * Ferd—Microhighs
- * Creed—Microhighs
- * Gerdrum—Microlows

Slope:

- * Ferd—4 to 8 percent
- * Creed—4 to 8 percent
- * Gerdrum—4 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Ethridge and similar soils: 0 to 5 percent
 Absher and similar soils: 0 to 5 percent
 Evanston and similar soils: 0 to 3 percent
 Chinook and similar soils: 0 to 2 percent

Major Component Description

Ferd

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Creed

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.5 inches

Gerdrum

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Flatcreek Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 14 to 17 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Vertic Ustifluvents

Typical Pedon

Flatcreek silty clay, in an area of Flatcreek-Nobe silty clays, 0 to 2 percent slopes, in rangeland, 2,300 feet south and 200 feet west of the northeast corner of sec. 9, T. 21 N., R. 12 E.

A—0 to 3 inches; grayish brown (10YR 5/2) silty clay, dark gray (10YR 4/1) moist; strong fine angular blocky structure; very hard, firm, very sticky and very plastic; many fine and very fine and few medium roots; mildly alkaline; clear smooth boundary.

By—3 to 11 inches; grayish brown (10YR 5/2) silty clay, dark gray (10YR 4/1) moist; weak medium prismatic structure parting to strong medium and coarse subangular blocky; extremely hard, firm, very sticky and very plastic; common fine and very fine roots; few fine and very fine tubular pores; few fine masses of gypsum; slightly effervescent; strongly alkaline; clear wavy boundary.

Byz—11 to 20 inches; grayish brown (10YR 5/2) silty clay, dark gray (10YR 4/1) moist; weak medium prismatic structure parting to strong medium subangular blocky; extremely hard, firm, very sticky and very plastic; common fine and very fine roots; few very fine tubular pores; few pressure faces; few fine masses of gypsum and other salts; slightly effervescent; moderately alkaline; clear wavy boundary.

BCyz1—20 to 43 inches; grayish brown (2.5Y 5/2) stratified clay and silty clay, dark grayish brown

(2.5Y 4/2) moist; massive; extremely hard, firm, very sticky and very plastic; few fine and very fine roots; common very fine tubular pores; common fine masses of gypsum and other salts; slightly effervescent; moderately alkaline; clear wavy boundary.

BCyz2—43 to 60 inches; light brownish gray (2.5Y 6/2) stratified clay and silty clay, grayish brown (2.5Y 5/2) moist; few fine faint light yellowish brown (2.5Y 6/4) mottles; massive; extremely hard, firm, very sticky and very plastic; few very fine tubular pores; few fine masses of gypsum and other salts; slightly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 40 to 60 percent

Depth to water table: 42 to 60 inches

Depth to the Byz horizon: 8 to 14 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 moist

Chroma: 1 or 2

Clay content: 40 to 60 percent

Electrical conductivity: 0 to 4

Sodium adsorption ratio: 0 to 4

Reaction: pH 7.4 to 8.4

By horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1 or 2

Texture: silty clay or clay

Clay content: 40 to 60 percent

Gypsum content: 0.5 to 1 percent

Electrical conductivity: 2 to 8

Sodium adsorption ratio: 4 to 13

Calcium carbonate equivalent: 1 to 3 percent

Reaction: pH 7.9 to 9.0

Byz horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1 or 2

Texture: silty clay, clay

Clay content: 40 to 60 percent

Gypsum content: 0.5 to 1 percent

Electrical conductivity: 8 to 16

Sodium adsorption ratio: 4 to 13

Calcium carbonate equivalent: 2 to 5 percent

Reaction: pH 7.9 to 9.0

BCyz horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Mottles: few or common in lower part

Texture: stratified clay and silty clay

Clay content: 40 to 60 percent

Gypsum content: 0.5 to 2 percent

Electrical conductivity: 8 to 16

Sodium adsorption ratio: 4 to 13

Calcium carbonate equivalent: 2 to 5 percent

Reaction: pH 7.9 to 9.0

303A—Flatcreek-Nobe silty clays, 0 to 2 percent slopes

Setting

Landform:

* Flatcreek—Flood plains

* Nobe—Flood plains

Position on landform:

* Flatcreek—Microlows

* Nobe—Microhighs

Slope:

* Flatcreek—0 to 2 percent

* Nobe—0 to 2 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 105 to 120 days

Composition

Major Components

Flatcreek and similar soils: 60 percent

Nobe and similar soils: 30 percent

Minor Components

Bigsag and similar soils: 0 to 5 percent

Sagedale and similar soils: 0 to 3 percent

Macar and similar soils: 0 to 2 percent

Major Component Description

Flatcreek

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Water table: Apparent

Salt affected: Saline within 30 inches

Available water capacity: Mainly 7.6 inches

Nobe

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Fleak Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Hills, escarpments
Parent material: Residuum from sandstone
Slope range: 8 to 70 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Mixed, frigid, shallow Aridic
 Ustipsamments

Typical Pedon

Fleak loamy fine sand, in an area of Fleak-Twilight-Rock outcrop complex, 25 to 70 percent slopes, in woodland, 825 feet west and 500 feet north of the southeast corner of sec. 25, T. 24 N., R. 16 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) loamy fine sand, dark grayish brown (2.5Y 4/2) moist; weak very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; strongly effervescent; neutral; clear smooth boundary.

C1—3 to 10 inches; light yellowish brown (2.5Y 6/4) loamy fine sand, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to weak fine subangular blocky; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; strongly effervescent; mildly alkaline; clear smooth boundary.

C2—10 to 18 inches; light brownish gray (2.5Y 6/2) loamy fine sand, light olive brown (2.5Y 5/4) moist; weak medium platy structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots and few fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Cr—18 to 60 inches; pale yellow (2.5Y 7/4) sandstone, light olive brown (2.5Y 5/4) moist; strongly effervescent; moderately alkaline.

Range in Characteristics

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

Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR, 7.5YR, or 2.5Y
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2 or 3
 Clay content: 0 to 15 percent
 Reaction: pH 6.6 to 7.8

C horizons

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: fine sand, loamy fine sand
 Clay content: 0 to 15 percent
 Reaction: pH 6.6 to 8.4

654F—Fleak-Twilight-Rock outcrop complex, 25 to 70 percent slopes**Setting***Landform:*

- * Fleak—Escarpments
- * Twilight—Hills
- * Rock outcrop—Escarpments

Position on landform:

- * Fleak—Shoulders and summits
- * Twilight—Backslopes and footslopes
- * Rock outcrop—Shoulders and summits

Slope:

- * Fleak—25 to 70 percent
- * Twilight—25 to 45 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Fleak and similar soils: 35 percent

Twilight and similar soils: 30 percent
 Rock outcrop: 20 percent

Minor Components

Busby and similar soils: 0 to 4 percent
 Yetull and similar soils: 0 to 3 percent
 Delpoint and similar soils: 0 to 3 percent
 Cabbart and similar soils: 0 to 2 percent
 Fleak soils in rangeland: 0 to 2 percent
 Douglas-fir (eastern part): 0 to 1 percent

Major Component Description

Fleak

Surface layer texture: Loamy fine sand
Depth class: Shallow (10 to 20 inches)
Drainage class: Excessively drained
Dominant parent material: Sandstone residuum
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 1.2 inches

Twilight

Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Rock outcrop

Definition: Exposures of sandstone bedrock

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

653F—Fleak-Twilight-Yetull complex, 25 to 70 percent slopes

Setting

Landform:

- * Fleak—Escarpments
- * Twilight—Hills
- * Yetull—Hills

Position on landform:

- * Fleak—Shoulders and summits
- * Twilight—Backslopes and footslopes
- * Yetull—Backslopes and footslopes

Slope:

- * Fleak—25 to 70 percent
- * Twilight—25 to 45 percent
- * Yetull—25 to 70 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Fleak and similar soils: 30 percent
 Twilight and similar soils: 30 percent
 Yetull and similar soils: 25 percent

Minor Components

Areas of rock outcrop: 0 to 3 percent
 Bascovy and similar soils: 0 to 3 percent
 Slopes of 8 to 25 percent: 0 to 3 percent
 Yamacall and similar soils: 0 to 2 percent
 Neldore and similar soils: 0 to 2 percent
 Ponderosa pine (eastern part): 0 to 2 percent

Major Component Description

Fleak

Surface layer texture: Loamy fine sand
Depth class: Shallow (10 to 20 inches)
Drainage class: Excessively drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.2 inches

Twilight

Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Yetull

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Fortbenton Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderately rapid (2.0 to 6.0 inches/hour) to 23 inches; below this depth slow (0.06 to 0.2 inch/hour)

Landform: Till plains, lake plains

Parent material: Eolian deposits over glacial till or lacustrine deposits

Slope range: 0 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Haploborolls

Typical Pedon

Fortbenton fine sandy loam, 0 to 4 percent slopes, in cropland, 600 feet south and 10 feet east of the northwest corner of sec. 2, T. 28 N., R 10 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; strong fine and very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; neutral; abrupt smooth boundary.

Bw1—6 to 13 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and few fine tubular pores; neutral; clear wavy boundary.

Bw2—13 to 23 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; moderate

medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and few fine tubular pores; few faint clay films on faces of peds; mildly alkaline; abrupt wavy boundary.

2Bk1—23 to 32 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; many very fine and few fine tubular pores; many fine and medium masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2Bk2—32 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; few very fine roots; common very fine and few fine tubular pores; many fine and medium masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches

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

Depth to the 2Bk horizon: 15 to 30 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry

Chroma: 2 or 3

Clay content: 10 to 18 percent

Reaction: pH 6.6 to 7.8

Bw1 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: fine sandy loam, sandy loam

Clay content: 10 to 18 percent

Reaction: pH 6.6 to 7.8

Bw2 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry

Chroma: 2, 3, or 4

Texture: fine sandy loam, sandy loam

Clay content: 10 to 18 percent

Reaction: pH 6.6 to 7.8

2Bk horizons

Hue: 10YR or 2.5Y

Value: 6 or 7 dry, 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: clay loam, silty clay loam
 Clay content: 27 to 35 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 0 to 4
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 9.0

361B—Fortbenton fine sandy loam, 0 to 4 percent slopes

Setting

Landform: Till plains
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Fortbenton and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 10 percent
 Kremlin and similar soils: 0 to 3 percent
 Lonesome and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian over till or lacustrine material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

365B—Fortbenton-Chinook fine sandy loams, 0 to 6 percent slopes

Setting

Landform:
 * Fortbenton—Till plains and lake plains
 * Chinook—Till plains and lake plains

Slope:
 * Fortbenton—0 to 6 percent
 * Chinook—0 to 6 percent

Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Kremlin and similar soils: 0 to 3 percent
 Lihen and similar soils: 0 to 3 percent
 Cozberg and similar soils: 0 to 3 percent
 Yetull and similar soils: 0 to 2 percent
 Lonna and similar soils: 0 to 2 percent
 Slopes more than 6 percent: 0 to 2 percent

Major Component Description

Fortbenton

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian over till or lacustrine material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches

Chinook

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

368C—Fortbenton-Hillon complex, 2 to 8 percent slopes

Setting

Landform:

- * Fortbenton—Till plains
- * Hillon—Till plains

Position on landform:

- * Fortbenton—Backslopes and footslopes
- * Hillon—Backslopes and shoulders

Slope:

- * Fortbenton—2 to 8 percent
- * Hillon—2 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Fortbenton and similar soils: 50 percent
Hillon and similar soils: 35 percent

Minor Components

Chinook and similar soils: 0 to 8 percent
Lihen and similar soils: 0 to 3 percent
Slopes more than 8 percent: 0 to 3 percent
Very gravelly soils: 0 to 1 percent

Major Component Description

Fortbenton

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Eolian over till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.8 inches

Hillon

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

563A—Fortbenton-Scobey fine sandy loams, 0 to 3 percent slopes

Setting

Landform:

- * Fortbenton—Till plains
- * Scobey—Till plains

Slope:

- * Fortbenton—0 to 3 percent
- * Scobey—0 to 3 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Fortbenton and similar soils: 50 percent
Scobey and similar soils: 35 percent

Minor Components

Scobey clay loam: 0 to 5 percent
Kevin and similar soils: 0 to 5 percent
Chinook and similar soils: 0 to 3 percent
Evanston and similar soils: 0 to 2 percent

Major Component Description

Fortbenton

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Eolian over till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches

Scobey

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Garlet Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Mountains
Parent material: Colluvium from igneous rocks
Slope range: 25 to 70 percent
Annual precipitation: 20 to 28 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed Typic Cryochrepts

Typical Pedon

Garlet cobbly loam, in an area of Garlet-Elkner complex, 25 to 70 percent slopes, in forest, 2,600 feet east and 1,500 feet north of the southwest corner of sec. 12, T. 28 N., R. 15 E.

O—3 inches to 0; slightly decomposed forest litter.

E—0 to 12 inches; light brownish gray (10YR 6/2) cobbly loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium and few coarse roots; many fine and very fine tubular pores; 15 percent cobbles, 15 percent pebbles; slightly acid; clear wavy boundary.

E/B1—12 to 26 inches; E part (80 percent) is pale brown (10YR 6/3) very cobbly loam, dark grayish brown (10YR 4/2) moist that surrounds the B part; B part (20 percent) is grayish brown (10YR 5/2) very cobbly loam, dark grayish brown (10YR 4/2) moist; texture mixed is very cobbly loam; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and common medium roots; many fine tubular pores; 20 percent cobbles, 30 percent pebbles; slightly acid; gradual wavy boundary.

E/B2—26 to 44 inches; E part (60 percent) is pale brown (10YR 6/3) extremely cobbly sandy loam, brown (10YR 4/3) moist that surrounds the B part; B part (40 percent) is grayish brown (10YR 5/2) very cobbly sandy loam, dark grayish brown (10YR 4/2) moist; texture mixed is very cobbly sandy loam; moderate fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine tubular pores; 30 percent cobbles, 40 percent pebbles; slightly acid; gradual wavy boundary.

B/E—44 to 60 inches; B part (75 percent) is brown (10YR 5/3) extremely cobbly sandy loam, dark brown (10YR 4/3) moist with interfingering of E part; E part (25 percent) is light yellowish brown (10YR 6/4) extremely cobbly sandy loam, dark yellowish brown (10YR 4/4) moist; texture mixed is extremely cobbly sandy loam; moderate fine and medium subangular blocky structure; slightly hard, very friable, nonsticky, and nonplastic; many very fine and fine tubular pores; 30 percent cobbles, 40 percent pebbles; slightly acid.

Range in Characteristics

Content of clay in the control section: 10 to 25 percent
Rock fragments in the control section: 40 to 80 percent

E horizon

Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 1, 2, or 3
 Clay content: 10 to 25 percent
 Rock fragments: 15 to 60 percent—0 to 30 percent cobbles and stones, 5 to 45 percent pebbles
 Reaction: pH 5.6 to 6.5

E2 horizon

Hue: 10YR or 7.5YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, sandy loam
 Clay content: 10 to 25 percent
 Rock fragments: 35 to 85 percent—10 to 40

percent cobbles and stones, 25 to 60 percent pebbles

Reaction: pH 5.6 to 6.5

E/B horizons

Hue: E part 10YR or 7.5YR, B part 10YR or 7.5YR

Value: E part 5 or 6, B part 6 or 7, dry; E part 4 or 5, B part 4 or 5 moist

Chroma: 2, 3, 4

Texture: sandy clay loam, sandy loam, loam

Clay content: 10 to 25 percent

Rock fragments: 40 to 80 percent—15 to 40 percent cobbles and stones, 25 to 60 percent pebbles

Reaction: pH 5.6 to 7.3

B/E horizon

Hue: B part 10YR or 7.5YR, E part 10YR or 7.5YR

Value: B part 6 or 7, E part 5 or 6 dry; B part 4 or 5, E part 4 or 5 moist

Chroma: 2, 3, or 4

Texture: sandy clay loam, sandy loam, loam

Clay content: 10 to 25 percent

Rock fragments: 40 to 80 percent—15 to 40 percent cobbles and stones, 25 to 60 percent pebbles

Reaction: pH 5.6 to 7.3

Some pedons have E/B horizons

580F—Garlet-Elkner complex, 25 to 70 percent slopes

Setting

Landform:

* Garlet—Mountains

* Elkner—Mountains

Position on landform:

* Garlet—Backslopes and footslopes

* Elkner—Backslopes and footslopes

Slope:

* Garlet—25 to 70 percent

* Elkner—25 to 45 percent

Mean annual precipitation: 20 to 28 inches

Frost-free period: 50 to 70 days

Composition

Major Components

Garlet and similar soils: 50 percent

Elkner and similar soils: 35 percent

Minor Components

Moderately deep soils: 0 to 5 percent

Very gravelly clay loam soils: 0 to 3 percent

Slopes less than 25 percent: 0 to 3 percent

Warwood and similar soils: 0 to 2 percent

Elve and similar soils: 0 to 2 percent

Major Component Description

Garlet

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Igneous colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 5.2 inches

Elkner

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 5.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Gerber Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Till plains, sedimentary plains, hills

Parent material: Glacial till or alluvium from shale

Slope range: 0 to 15 percent

Annual precipitation: 14 to 19 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 90 to 120 days

Taxonomic Class: Fine, montmorillonitic, Vertic Argiborolls

Typical Pedon

Gerber silty clay, 0 to 4 percent slopes, in cropland, 1,200 feet east and 900 feet south of the northwest corner of sec. 24, T. 21 N., R. 6 E.

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

Bt1—7 to 11 inches; brown (10YR 4/3) silty clay, dark brown (10YR 3/3) moist; strong medium prismatic structure parting to strong fine and medium angular blocky; extremely hard, very firm, very sticky and very plastic; few very fine and fine roots; few very fine tubular pores; many distinct clay films on faces of peds; vertical cracks 1 to 2 inches wide when dry; mildly alkaline; clear wavy boundary.

Bt2—11 to 16 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong fine and medium subangular blocky; extremely hard, very firm, very sticky and very plastic; few fine and very fine roots; few very fine tubular pores; many distinct clay films on faces of peds; vertical cracks 1 to 2 inches wide when dry; mildly alkaline; gradual wavy boundary.

Btk—16 to 28 inches; brown (10YR 5/3) silty clay, brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very hard, very firm, very sticky and very plastic; few fine and very fine roots; few very fine tubular pores; common faint clay films on faces of peds in upper part; few pressure faces in lower part; common fine and medium masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk—28 to 46 inches; pale brown (10YR 6/3) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; few very fine tubular pores; few pressure faces in upper part; many fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BCK—46 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky and very plastic; few very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 45 to 60 percent
Depth to the Btk or Bk horizon: 12 to 20 inches

Ap horizon

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

Bt1, Bt2, and Btk horizons

Value: 4 or 5 dry, 3 or 4 moist
Chroma: 2 or 3
Texture: silty clay, clay
Clay content: 45 to 60 percent
Reaction: pH 7.4 to 8.4

Bk and BCK horizons

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

681C—Gerber clay, 4 to 8 percent slopes

Setting

Landform: Till plains
Slope: 4 to 8 percent
Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Gerber and similar soils: 85 percent

Minor Components

Bearpaw and similar soils: 0 to 6 percent
Vida and similar soils: 0 to 5 percent
Waltham and similar soils: 0 to 2 percent
Sunburst and similar soils: 0 to 2 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

68B—Gerber silty clay, 0 to 4 percent slopes

Setting

Landform: Till plains

Slope: 0 to 4 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Gerber and similar soils: 85 percent

Minor Components

Calcareous surface layers: 0 to 5 percent

Bearpaw and similar soils: 0 to 4 percent

Savage and similar soils: 0 to 3 percent

Waltham and similar soils: 0 to 2 percent

Nishon and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Gerdrum Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Alluvial fans, stream terraces, small drainageways

Parent material: Alluvium, glaciofluvial deposits

Slope range: 0 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Gerdrum clay loam, in an area of Ferd-Creed-Gerdrum complex, 0 to 4 percent slopes, in rangeland, 2,000 feet west and 1,500 feet south of the northeast corner of sec. 20, T. 27 N., R. 5 E.

E—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak thin and very thin platy structure parting to weak very fine granular; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; abrupt smooth boundary.

Btn1—3 to 6 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong fine and medium columnar structure parting to strong fine subangular blocky; very hard, very firm, sticky and plastic; many fine and very fine roots; common very fine tubular pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Btn2—6 to 11 inches; pale brown (10YR 6/3) clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium prismatic structure parting to strong fine and medium subangular blocky; very hard, very firm, sticky and plastic; common fine and very fine roots; common very fine tubular pores; many faint clay films on faces of peds; slightly effervescent; moderately alkaline; clear wavy boundary.

Btnk—11 to 16 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; few faint clay films on faces of peds; common fine masses of lime; violently effervescent; strongly alkaline; gradual wavy boundary.

Bknyz1—16 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few

very fine roots; common very fine tubular pores; few fine masses of gypsum and other salts; few fine and medium masses of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bknyz2—32 to 42 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; massive; hard, firm, sticky and plastic; few fine roots; many very fine tubular pores; common fine seams and masses of gypsum and other salts; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bnyz—42 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; many very fine tubular pores; few medium masses of gypsum and other salts; strongly effervescent; moderately alkaline.

Range in Characteristics

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

Depth to the Btk horizon: 10 to 24 inches

Depth to the Bknyz1 horizon: 15 to 24 inches

E horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Btn1 horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: clay, silty clay, silty clay loam

Clay content: 35 to 55 percent

Rock fragments: 0 to 10 percent pebbles

Structure: fine to coarse columnar, or medium or coarse blocky

Hardness: extremely or very hard when dry

Electrical conductivity: 1 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 20, pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2

Reaction: pH 7.4 to 9.0

Btn2 horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: clay, silty clay, silty clay loam

Clay content: 35 to 55 percent

Rock fragments: 0 to 10 percent pebbles

Structure: fine to coarse prismatic, or medium or coarse blocky

Hardness: extremely or very hard when dry

Electrical conductivity: 1 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 20, pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2

Reaction: pH 7.4 to 9.0

Btnk horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: clay, silty clay, silty clay loam, clay loam

Clay content: 35 to 55 percent

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 13 to 20

Reaction: pH 7.4 to 9.0

Bknyz and Bnyz horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: clay loam, sandy clay loam, clay, silty clay

Clay content: 30 to 50 percent

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Gypsum content: 1 to 5 percent

Reaction: pH 7.9 to 9.0

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

Setting

Landform:

* Gerdrum—Alluvial fans, stream terraces, and drainageways

* Absher—Alluvial fans, stream terraces, and drainageways

* Creed—Alluvial fans, stream terraces, and drainageways

Position on landform:

* Gerdrum—Microlows

* Absher—Microlows

* Creed—Microhighs

Slope:

- * Gerdrum—0 to 2 percent
- * Absher—0 to 2 percent
- * Creed—0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Gerdrum and similar soils: 40 percent
 Absher and similar soils: 25 percent
 Creed and similar soils: 20 percent

Minor Components

Strongly sodic surface layers: 0 to 5 percent
 Slopes more than 2 percent: 0 to 4 percent
 Ferd and similar soils: 0 to 3 percent
 Ethridge and similar soils: 0 to 2 percent
 Gravelly sandy loam substratum: 0 to 1 percent

Major Component Description

Gerdrum

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
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

Absher

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

Creed

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Glendive Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Glendive sandy loam, in an area of Havre-Glendive complex, 0 to 1 percent slopes, in cropland, 1,500 feet east and 1,100 feet south of the northwest corner of sec. 9, T. 23 N., R. 7 E.

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

C1—6 to 29 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine pores; slightly effervescent; moderately alkaline; gradual smooth boundary.

C2—29 to 60 inches; light brownish gray (2.5Y 6/2) stratified sandy loam, loam and loamy sand, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine pores; slightly effervescent; moderately alkaline.

Range in Characteristics

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

Ap horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2 or 3
 Clay content: 5 to 15 percent
 Effervescence: none to violently
 Reaction: pH 6.6 to 8.4

C1 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, silt loam, sandy loam, fine sandy loam
 Clay content: 5 to 18 percent
 Rock fragments: 0 to 15 percent pebbles
 Effervescence: slightly to violently
 Reaction: pH 7.4 to 9.0

C2 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, silt loam, sandy loam, fine sandy loam
 Clay content: 5 to 18 percent
 Rock fragments: 0 to 15 percent pebbles
 Effervescence: slightly to violently
 Reaction: pH 7.4 or 9.0

81A—Glendive sandy loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Glendive and similar soils: 85 percent

Minor Components

Havre and similar soils: 0 to 6 percent
 Harlake and similar soils: 0 to 3 percent
 Moderately saline soils: 0 to 2 percent
 Gravelly sand substratums: 0 to 2 percent
 Somewhat poorly drained soils: 0 to 2 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 8.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Hanly Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Sandy, mixed, frigid Aridic Ustifluvents

Typical Pedon

Hanly loamy sand, in an area of Rivra-Hanly complex, 0 to 2 percent slopes, in woodland, 700 feet east and 700 feet south of the northwest corner of sec. 4, T. 25 N., R 9 E.

A—0 to 5 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, very friable, nonsticky and nonplastic; many fine and medium roots; strongly effervescent; mildly alkaline; abrupt smooth boundary.

C1—5 to 9 inches; pale brown (10YR 6/3) sand and coarse sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; common fine roots; strongly effervescent; moderately alkaline; abrupt wavy boundary.

C2—9 to 40 inches; pale brown (10YR 6/3) fine sand and sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; few medium roots; contains strata of light brownish gray (10YR 6/2) loam; strongly effervescent; moderately alkaline; gradual wavy boundary.

C3—40 to 60 inches; light brownish gray (10YR 6/2) sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few fine roots; slightly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 0 to 10 percent

A horizon

Hue: 2.5Y or 10YR
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 or 3
Clay content: 5 to 10 percent
Reaction: pH 6.6 to 8.4

C horizon

Hue: 10YR, 2.5Y, or 5YR
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Clay content: 5 to 10 percent
Reaction: pH 6.6 to 8.4

Harlake Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 1 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustifluvents

Typical Pedon

Harlake silty clay, 0 to 1 percent slopes, in cropland, 1,100 feet south and 2,000 feet west of the northeast corner of sec. 33, T. 24 N., R. 8 E.

Ap—0 to 8 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium granular and subangular blocky structure;

hard, firm, very sticky and very plastic; common fine and medium roots; slightly effervescent; mildly alkaline; abrupt smooth boundary.

C1—8 to 28 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; common fine and medium roots; common very fine tubular pores; slightly effervescent; moderately alkaline; clear smooth boundary.

C2—28 to 48 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; common fine and very fine roots; common very fine tubular pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

C3—48 to 60 inches; light brownish gray (2.5Y 6/2) loam consisting of strata of fine sandy loam and silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; many very fine tubular pores; strongly effervescent; moderately alkaline.

Range in Characteristics

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

Ap horizon

Hue: 10YR or 2.5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 40 to 55 percent
Effervescence: slightly or strongly
Reaction: pH 7.4 to 8.4

C1 horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: clay, silty clay, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay
Clay content: 35 to 60 percent
Effervescence: strongly or violently
Reaction: pH 7.4 to 8.4

C2 horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: clay, silty clay, or silty clay loam consisting of stratified layers of clay, silt loam, silty clay loam, and silty clay

Clay content: 35 to 60 percent
 Effervescence: strongly or violently
 Reaction: pH 7.4 to 8.4

C3 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: silt loam, loam, clay loam, or fine sandy loam consisting of stratified layers of silty clay loam, silt loam, and fine sandy loam
 Clay content: 15 to 35 percent
 Effervescence: strongly or violently
 Reaction: pH 7.9 to 9.0

90A—Harlake silty clay, 0 to 1 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 1 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Harlake and similar soils: 85 percent

Minor Components

Havre and similar soils: 0 to 5 percent
 Glendive and similar soils: 0 to 4 percent
 Areas that occasionally flood: 0 to 2 percent
 Somewhat poorly drained soils: 0 to 2 percent
 Poorly drained soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Havre Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Havre loam, in an area of Havre-Glendive complex, 0 to 1 percent slopes, in cropland, 1,200 feet south and 1,100 feet east of the northwest corner of sec. 12, T. 25 N., R. 9 E.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure parting to weak fine and very fine granular; soft, friable, nonsticky and nonplastic; many fine and medium roots; slightly effervescent; neutral; clear smooth boundary.

C1—6 to 35 inches; grayish brown (2.5Y 5/2) loam with strata of silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many fine and medium roots; many very fine tubular pores; common fine threads of gypsum in silty clay loam strata; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—35 to 60 inches; grayish brown (2.5Y 5/2) loam with strata of fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, friable, slightly sticky and slightly plastic; disseminated lime; strongly effervescent; mildly alkaline.

Range in Characteristics

Content of clay in the control section: 18 to 35 percent
Soil phases: Rarely flooded, occasionally flooded

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: loam, silty clay loam
 Clay content: 20 to 35 percent
 Effervescence: none to strongly
 Reaction: pH 6.6 to 7.8

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, or clay loam which consist of strata of silt loam, fine sandy loam, silty clay loam, and clay loam
 Clay content: 18 to 35 percent
 Effervescence: slightly or strongly
 Reaction: pH 7.4 to 8.4

C2 horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: loam, silt loam, or clay loam which consist of strata of silt loam, fine sandy loam, silty clay loam, and clay loam
 Clay content: 18 to 35 percent
 Effervescence: slightly or strongly
 Reaction: pH 7.4 to 8.4

60A—Havre loam, 0 to 2 percent slopes**Setting**

Landform: Flood plains
Slope: 0 to 2 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Havre and similar soils: 85 percent

Minor Components

Glendive and similar soils: 0 to 5 percent
 Harlake and similar soils: 0 to 3 percent
 Moderately saline soils: 0 to 2 percent
 Somewhat poorly drained soils: 0 to 2 percent
 Poorly drained soils: 0 to 2 percent
 Hanly and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

602A—Havre silty clay loam, 0 to 1 percent slopes**Setting**

Landform: Flood plains
Slope: 0 to 1 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Havre and similar soils: 85 percent

Minor Components

Harlake and similar soils: 0 to 8 percent
 Glendive and similar soils: 0 to 3 percent
 Somewhat poorly drained soils: 0 to 2 percent
 Poorly drained soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

601A—Havre-Glendive complex, 0 to 1 percent slopes

Setting

Landform:

- * Havre—Flood plains
- * Glendive—Flood plains

Slope:

- * Havre—0 to 1 percent
- * Glendive—0 to 1 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Havre and similar soils: 50 percent
Glendive and similar soils: 35 percent

Minor Components

Harlake and similar soils: 0 to 5 percent
Areas that occasionally flood: 0 to 3 percent
Hanly and similar soils: 0 to 2 percent
Somewhat poorly drained soils: 0 to 2 percent
Poorly drained soils: 0 to 2 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 9.7 inches

Glendive

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Available water capacity: Mainly 8.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

603A—Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded

Setting

Landform: (fig. 4)

- * Havre—Flood plains
- * Glendive—Flood plains

Slope:

- * Havre—0 to 2 percent
- * Glendive—0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Havre and similar soils: 45 percent
Glendive and similar soils: 40 percent

Minor Components

Hanly and similar soils: 0 to 3 percent
Areas that frequently flood: 0 to 3 percent
Somewhat poorly drained soils: 0 to 3 percent
Poorly drained soils: 0 to 2 percent
Rivra and similar soils: 0 to 2 percent
Harlake and similar soils: 0 to 2 percent

Major Component Description

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: Occasional

Available water capacity: Mainly 9.7 inches

Glendive

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)



Figure 4. Typical area of Havre-Glendive complex, 0 to 2 percent slopes, occasionally flooded on the Marias River flood plain. Neldore-Rock outcrop complex, 25 to 70 percent slopes, is on the steep hills and escarpments in the background.

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Occasional
Available water capacity: Mainly 8.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Hedoes Series

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

Permeability: Moderate (0.6 to 2.0 inches/hour) to 20 inches; below this depth moderately rapid (2.0 to 6.0 inches/hour)
Landform: Alluvial fans, hills
Parent material: Alluvium
Slope range: 2 to 45 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Coarse-loamy, mixed Pachic Haploborolls

Typical Pedon

Hedoes loam, in an area of Hedoes-Belain loams, 8 to 25 percent slopes, in rangeland, 2,100 feet south and 200 feet west of the northeast corner of sec. 29, T. 27 N., R. 16 E.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; strong fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear wavy boundary.

Bw1—5 to 11 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine tubular pores; neutral; clear wavy boundary.

Bw2—11 to 20 inches; dark brown (10YR 4/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; many very fine tubular pores; neutral, clear wavy boundary.

Bw3—20 to 31 inches; brown (10YR 5/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; many very fine tubular pores; 5 percent pebbles; neutral; gradual wavy boundary.

Bk—31 to 60 inches; grayish brown (10YR 5/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; 20 percent pebbles; few fine masses of lime; slightly effervescent; mildly alkaline.

Range in Characteristics

Mollic epipedon thickness: More than 16 inches

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

Depth to the Bk horizon: 30 to 40 inches

A horizons

Hue: 7.5YR, 10YR, or 2.5Y

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Texture: loam, sandy loam

Clay content: 5 to 15 percent

Rock fragments: 0 to 25 percent—0 to 5 percent cobbles, 0 to 2 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizons

Hue: 7.5YR, 10YR, or 2.5Y

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

Chroma: 2 or 3

Texture: loam, sandy loam

Clay content: 5 to 18 percent

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

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: sandy loam, coarse sandy loam

Clay content: 0 to 10 percent

Rock fragments: 10 to 35 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 6.6 to 8.4

76C—Hedoes loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 2 to 8 percent

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Hedoes and similar soils: 85 percent

Minor Components

Farnuf and similar soils: 0 to 5 percent

Hedoes sandy loam: 0 to 5 percent

Gravelly sand substratum: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

761C—Hedoes-Belain loams, 2 to 8 percent slopes

Setting

Landform:

- * Hedoes—Alluvial fans
- * Belain—Bedrock-floored plains

Position on landform:

- * Hedoes—Footslopes
- * Belain—Backslopes and shoulders

Slope:

- * Hedoes—2 to 8 percent
- * Belain—2 to 8 percent

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Hedoes and similar soils: 50 percent

Belain and similar soils: 40 percent

Minor Components

Whitlash and similar soils: 0 to 5 percent

Hedoes sandy loam: 0 to 3 percent

Belain sandy loam: 0 to 2 percent

Major Component Description

Hedoes

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

Belain

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

761E—Hedoes-Belain loams, 8 to 25 percent slopes

Setting

Landform:

- * Hedoes—Hills
- * Belain—Hills

Position on landform:

- * Hedoes—Footslopes
- * Belain—Backslopes and shoulders

Slope:

- * Hedoes—8 to 15 percent
- * Belain—8 to 25 percent

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Hedoes and similar soils: 50 percent

Belain and similar soils: 35 percent

Minor Components

Whitlash and similar soils: 0 to 5 percent

Perma and similar soils: 0 to 5 percent

Hedoes sandy loam: 0 to 3 percent

Belain sandy loam: 0 to 2 percent

Major Component Description

Hedoes

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.2 inches

Belain

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Hillon Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains, hills, escarpments
Parent material: Glacial till
Slope range: 2 to 70 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Hillon loam, 25 to 60 percent slopes, in rangeland, 1,800 feet west and 800 feet north of the southeast corner of sec. 29, T. 27 N., R. 5 E.

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

Bk1—4 to 14 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine tubular pores; common fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—14 to 24 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky

structure; hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores; common fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BCy—24 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; 5 percent pebbles; few fine and medium masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

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

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 20 to 27 percent
 Rock fragments: 0 to 25 percent—0 to 10 percent cobbles and stones, 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Effervescence: none to violently
 Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, clay loam
 Clay content: 20 to 35 percent with 25 to 35 percent fine and coarser sand
 Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Effervescence: strongly or violently
 Bulk density: 1.55 to 1.75 g/ccm
 Reaction: pH 7.9 to 9.0

BCy horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam or clay loam
 Clay content: 20 to 35 percent with 25 to 35 percent fine and coarser sand
 Rock fragments: 0 to 15 percent pebbles
 Bulk density: 1.55 to 1.75 g/ccm
 Effervescence: strongly to violently
 Reaction: pH 7.9 to 9.0

22F—Hillon loam, 25 to 60 percent slopes**Setting**

Landform: Hills

Slope: 25 to 60 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Hillon and similar soils: 85 percent

Minor Components

Sunburst and similar soils: 0 to 5 percent

Cabbart and similar soils: 0 to 3 percent

Delpoint and similar soils: 0 to 3 percent

Yetull and similar soils: 0 to 2 percent

Fleak and similar soils: 0 to 1 percent

Bascovy and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

222D—Hillon-Delpoint loams, 8 to 25 percent slopes**Setting**

Landform:

* Hillon—Hills

* Delpoint—Hills

Position on landform:

* Hillon—Backslopes and shoulders

* Delpoint—Backslopes and footslopes

Slope:

* Hillon—8 to 25 percent

* Delpoint—8 to 25 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Hillon and similar soils: 55 percent

Delpoint and similar soils: 30 percent

Minor Components

Joplin and similar soils: 0 to 10 percent

Cabbart and similar soils: 0 to 3 percent

Yawdim and similar soils: 0 to 2 percent

Major Component Description**Hillon**

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

223E—Hillon-Fleak complex, 15 to 35 percent slopes

Setting

Landform:

- * Hillon—Hills
- * Fleak—Hills

Position on landform:

- * Hillon—Backslopes and shoulders
- * Fleak—Backslopes

Slope:

- * Hillon—15 to 35 percent
- * Fleak—15 to 35 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Hillon and similar soils: 55 percent
Fleak and similar soils: 30 percent

Minor Components

Twilight and similar soils: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Cabbart and similar soils: 0 to 3 percent
Delpoint and similar soils: 0 to 2 percent

Major Component Description

Hillon

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Fleak

Surface layer texture: Loamy fine sand

Depth class: Shallow (10 to 20 inches)

Drainage class: Excessively drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

227F—Hillon-Fleak-Rock outcrop complex, 25 to 70 percent slopes

Setting

Landform:

- * Hillon—Escarpments
- * Fleak—Escarpments
- * Rock outcrop—Escarpments

Position on landform:

- * Hillon—Backslopes and shoulders
- * Fleak—Backslopes
- * Rock outcrop—Backslopes

Slope:

- * Hillon—25 to 70 percent
- * Fleak—25 to 70 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Hillon and similar soils: 40 percent
Fleak and similar soils: 30 percent
Rock outcrop: 15 percent

Minor Components

Twilight and similar soils: 0 to 5 percent
Busby and similar soils: 0 to 5 percent
Cabbart and similar soils: 0 to 3 percent
Yawdim and similar soils: 0 to 2 percent

Major Component Description

Hillon

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Fleak

Surface layer texture: Loamy fine sand

Depth class: Shallow (10 to 20 inches)

Drainage class: Excessively drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

Rock outcrop

Definition: Exposures of sandstone bedrock

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

224E—Hillon-Joplin loams, 8 to 25 percent slopes

Setting

Landform:

* Hillon—Hills

* Joplin—Hills

Position on landform:

* Hillon—Backslopes and shoulders

* Joplin—Backslopes and footslopes

Slope:

* Hillon—8 to 25 percent

* Joplin—8 to 15 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Hillon and similar soils: 50 percent

Joplin and similar soils: 40 percent

Minor Components

Telstad and similar soils: 0 to 8 percent

Very gravelly surface layers: 0 to 1 percent

Gravelly sand substratums: 0 to 1 percent

Major Component Description

Hillon

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Joplin

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

221E—Hillon-Kevin clay loams, 8 to 25 percent slopes

Setting

Landform:

* Hillon—Hills

* Kevin—Hills

Position on landform:

* Hillon—Backslopes and shoulders

* Kevin—Backslopes and footslopes

Slope:

* Hillon—8 to 25 percent

* Kevin—8 to 15 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Hillon and similar soils: 50 percent

Kevin and similar soils: 40 percent

Minor Components

Scobey and similar soils: 0 to 6 percent

Very cobbly surface layers: 0 to 2 percent

Cabbart and similar soils: 0 to 1 percent

Bascovy and similar soils: 0 to 1 percent

Major Component Description

Hillon

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

229E—Hillon-Lambeth complex, 15 to 35 percent slopes

Setting

Landform:

- * Hillon—Hills
- * Lambeth—Hills

Position on landform:

- * Hillon—Backslopes and footslopes
- * Lambeth—Backslopes and shoulders

Slope:

- * Hillon—15 to 35 percent
- * Lambeth—15 to 35 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Hillon and similar soils: 45 percent
 Lambeth and similar soils: 45 percent

Minor Components

Kevin and similar soils: 0 to 5 percent
 Sunburst and similar soils: 0 to 5 percent

Major Component Description

Hillon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.9 inches

Lambeth

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Joplin Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains, hills
Parent material: Glacial till
Slope range: 0 to 15 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic
 Argiborolls

Typical Pedon

Joplin loam, in an area of Telstad-Joplin loams, 0 to 4 percent slopes, in cropland, 300 feet south and 100 feet west of the northeast corner of sec. 28, T. 26 N., R. 12 E.

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

Bt—6 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, slightly

sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; many faint clay films on faces of peds; few pebbles; neutral; abrupt smooth boundary.

Bk—9 to 21 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and few fine roots; many very fine and common fine tubular pores; few pebbles; many fine and medium masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

Bck—21 to 38 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine and few fine tubular pores; 5 percent pebbles; many fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

C—38 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; 10 percent pebbles; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 9 inches and may include all of the Bt horizon

Depth to the Bk horizon: Less than 10 inches

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 10 to 27 percent

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

Effervescence: none to violently

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: loam, clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bk and Bck horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: loam, clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 35 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: loam, clay loam

Clay content: 18 to 32 percent

Rock fragments: 0 to 35 percent pebbles

Bulk density: 1.6 to 1.8 gr/cm

Reaction: pH 7.4 to 8.4

421C—Joplin-Hillon loams, 2 to 8 percent slopes

Setting

Landform:

* Joplin—Till plains

* Hillon—Till plains

Position on landform:

* Joplin—Backslopes and footslopes

* Hillon—Backslopes and shoulders

Slope:

* Joplin—2 to 8 percent

* Hillon—2 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Joplin and similar soils: 55 percent

Hillon and similar soils: 30 percent

Minor Components

Telstad and similar soils: 0 to 10 percent

Chinook and similar soils: 0 to 2 percent

Slopes more than 8 percent: 0 to 2 percent

Nishon and similar soils: 0 to 1 percent

Major Component Description

Joplin

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

Hillon

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Kenilworth Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to 12 inches; below this depth slow (0.06 to 0.2 inch/hour)

Landform: Till plains, lake plains

Parent material: Eolian over lacustrine deposits

Slope range: 0 to 3 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Kenilworth fine sandy loam, in an area of Kenilworth-Fortbenton fine sandy loams, 0 to 3 percent slopes, in cropland, 2,000 feet north and 1,400 feet west of the southeast corner of sec. 21, T. 28 N., R. 11 E.

Ap—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular

structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; neutral; abrupt smooth boundary.

Bt1—5 to 8 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine tubular pores; common faint clay films on faces of peds; neutral; clear smooth boundary.

Bt2—8 to 12 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; many faint clay films on faces of peds; neutral; clear wavy boundary.

2Bt3—12 to 16 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; many thin clay films on ped faces; neutral; gradual wavy boundary.

2Bk1—16 to 29 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; many medium and coarse masses of lime; violently effervescent; mildly alkaline; gradual wavy boundary.

2Bk2—29 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium angular blocky structure; hard, firm, sticky and plastic; common very fine tubular pores; few fine masses of lime in the upper part; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches

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

Depth to the 2Bt horizon: 12 to 24 inches

Depth to the 2Bk horizon: 12 to 26 inches

Ap horizon

Value: 4 or 5 dry, 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 5 to 18 percent
 Reaction: pH 6.6 to 7.8

Bt1 horizon

Value: 4 or 5 dry, 3 or 4 moist
 Chroma: 2 or 3
 Texture: fine sandy loam, sandy clay loam
 Clay content: 15 to 25 percent and more than 45 percent fine and coarser sand
 Reaction: pH 6.6 to 7.8

Bt2 horizon

Value: 4 or 5 dry, 3 or 4 moist
 Chroma: 2, 3, or 4
 Texture: sandy clay loam, fine sandy loam, loam
 Clay content: 18 to 30 percent and more than 45 percent fine and coarser sand
 Bulk density: 1.40 to 1.60 gr/cm
 Reaction: pH 6.6 to 7.8

2Bt3 horizon

Chroma: 3 or 4
 Texture: sandy clay loam, clay loam
 Clay content: 20 to 35 percent and 20 to more than 45 percent fine and coarser sand
 Bulk density: 1.40 to 1.60 gr/cm
 Reaction: pH 6.6 to 7.8

2Bk1 horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: clay loam, silty clay loam
 Clay content: 27 to 35 percent
 Rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Bulk density: greater than 1.6 gr/cm
 Reaction: pH 7.4 to 8.4
 A fine sandy loam Bk horizon is allowed above the discontinuity

2Bk2 horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: clay loam, silty clay loam
 Clay content: 27 to 35 percent
 Rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 9.0
 Some pedons have a 2Bk horizon

351B—Kenilworth-Fortbenton fine sandy loams, 0 to 3 percent slopes**Setting***Landform:*

- * Kenilworth—Till plains and lake plains
- * Fortbenton—Till plains and lake plains

Slope:

- * Kenilworth—0 to 3 percent
- * Fortbenton—0 to 3 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Kenilworth and similar soils: 50 percent
 Fortbenton and similar soils: 35 percent

Minor Components

Chinook and similar soils: 0 to 5 percent
 Lihen and similar soils: 0 to 5 percent
 Telstad and similar soils: 0 to 3 percent
 Evanston and similar soils: 0 to 2 percent

Major Component Description**Kenilworth**

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian over till or lacustrine material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.4 inches

Fortbenton

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Eolian over till or lacustrine material
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Kevin Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Till plains, hills

Parent material: Glacial till

Slope range: 0 to 15 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic
Argiborolls

Typical Pedon

Kevin clay loam, in an area of Scobey-Kevin clay loams, 4 to 8 percent slopes, in cropland, 100 feet south and 1,100 feet east of the northwest corner of sec. 1, T. 23 N., R. 3 E.

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

Bt—6 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky and plastic; many very fine and fine roots; common very fine tubular pores; many distinct clay films on faces of peds; neutral; clear wavy boundary.

Bk1—9 to 15 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky and plastic; many very fine and fine roots; many very fine tubular pores; few thin clay films on faces of peds; few medium masses of lime; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk2—15 to 31 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky and plastic; few very fine and fine roots;

many very fine and fine tubular pores; many fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BCky—31 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; massive; hard, firm, sticky and plastic; few very fine and fine tubular pores; few medium masses of lime and gypsum, slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 12 inches and may include all of the Bt horizon

Content of clay in the control section: 27 to 35 percent

Depth to the Bk horizon: Less than 10 inches

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

Chroma: 2 or 3

Clay content: 27 to 32 percent

Rock fragments: 0 to 60 percent—0 to 50 percent pebbles, 0 to 10 percent cobbles

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: clay loam or clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 15 percent

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Rock fragments: 0 to 15 percent pebbles

Bulk density: 1.6 to 1.8 gr/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

BCky horizons

Hue: 10YR, 5Y, or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 27 to 35 percent

Rock fragments: 0 to 15 percent

Bulk density: 1.6 to 1.8 gr/cm

Calcium carbonate equivalent: 1 to 10 percent

Gypsum content: 0 to 2 percent

Reaction: pH 7.9 to 8.4

44B—Kevin clay loam, 0 to 4 percent slopes**Setting**

Landform: Till plains
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Kevin and similar soils: 85 percent

Minor Components

Scobey and similar soils: 0 to 8 percent
 Hillon and similar soils: 0 to 6 percent
 Nishon and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

442C—Kevin-Elloam clay loams, 2 to 8 percent slopes**Setting**

Landform:
 * Kevin—Till plains
 * Elloam—Till plains
Position on landform:
 * Kevin—Backslopes and footslopes
 * Elloam—Microlows
Slope:
 * Kevin—2 to 8 percent
 * Elloam—2 to 8 percent

Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Kevin and similar soils: 60 percent
 Elloam and similar soils: 25 percent

Minor Components

Hillon and similar soils: 0 to 9 percent
 Tanna and similar soils: 0 to 3 percent
 Bascovy and similar soils: 0 to 2 percent
 Nishon and similar soils: 0 to 1 percent

Major Component Description**Kevin**

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Elloam

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

441C—Kevin-Hillon clay loams, 2 to 8 percent slopes**Setting**

Landform:
 * Kevin—Till plains
 * Hillon—Till plains

Position on landform:

- * Kevin—Backslopes and footslopes
- * Hillon—Backslopes and shoulders

Slope:

- * Kevin—2 to 8 percent
- * Hillon—2 to 8 percent

Mean annual precipitation: 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Kevin and similar soils: 50 percent
 Hillon and similar soils: 35 percent

Minor Components

Scobey and similar soils: 0 to 10 percent
 Slopes less than 2 percent: 0 to 3 percent
 Very cobbly surface layers: 0 to 1 percent
 Nishon and similar soils: 0 to 1 percent

Major Component Description**Kevin**

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Hillon

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

444D—Kevin-Scobey clay loams, 8 to 15 percent slopes**Setting***Landform:*

- * Kevin—Hills
- * Scobey—Hills

Position on landform:

- * Kevin—Backslopes and shoulders
- * Scobey—Footslopes

Slope:

- * Kevin—8 to 15 percent
- * Scobey—8 to 15 percent

Mean annual precipitation: 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Kevin and similar soils: 55 percent
 Scobey and similar soils: 30 percent

Minor Components

Hillon and similar soils: 0 to 7 percent
 Slopes more than 15 percent: 0 to 5 percent
 Very gravelly surface layers: 0 to 3 percent

Major Component Description**Kevin**

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Scobey

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Klayent Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Poorly drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 1 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Fine, mixed (calcareous), frigid
Fluvaquentic Endoaquolls

Typical Pedon

Klayent clay loam, 0 to 1 percent slopes, in rangeland, 1,300 feet east and 800 feet south of the northwest corner of sec. 16, T. 21 N., R. 10 E.

A—0 to 6 inches; black (10YR 2/1) clay loam, dark gray (10YR 4/1) dry; strong fine granular structure; hard, friable, sticky and plastic; many fine and very fine roots; neutral; clear smooth boundary.

Bw—6 to 14 inches; very dark gray (10YR 3/1) clay loam, dark grayish brown (10YR 4/2) dry; few fine distinct brownish yellow (10YR 6/6) mottles; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; many fine and very fine roots; common very fine tubular pores; moderately alkaline; clear wavy boundary.

Bk—14 to 20 inches; dark gray (10YR 4/1) clay, gray (10YR 5/1) dry; many medium distinct brownish yellow (10YR 6/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; common fine and very fine roots; common very fine tubular pores; common fine and medium masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkyg1—20 to 32 inches; dark gray (5Y 4/1) clay loam, light gray (5Y 6/1) dry; many medium prominent brownish yellow (10YR 6/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, very sticky and very plastic; few fine and very fine roots; common very fine tubular pores; many fine

and few medium masses of lime; few fine masses of gypsum; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkyg2—32 to 60 inches; dark gray (5Y 4/1) clay loam with strata of silty clay and sandy loam, light gray (5Y 6/1) dry; many distinct light yellowish brown (10YR 6/4) mottles; massive; very hard, firm, sticky and plastic; common very fine tubular pores; common fine and few medium masses of lime; few fine masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 10 to 16 inches

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

Depth to water table: 12 to 36 inches

Depth to the Bk horizon: 12 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 1 or 2

Clay content: 27 to 40 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR to 5Y

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

Chroma: 1 or 2

Texture: silty clay loam, clay loam, clay

Clay content: 35 to 50 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 7.9 to 9.0

Bk and Bkyg horizons

Hue: 10YR to 5Y matrix, 10YR or 2.5Y mottles

Value: 4, 5, or 6 matrix, 6, 7, or 8 mottles dry; 3 or 4 matrix, 6 or 7 mottles moist

Chroma: 1 or 2 matrix, 2, 4, 6, or 8 mottles

Texture: silty clay loam, clay loam, clay

Clay content: 35 to 50 percent

Rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

140A—Klayent clay loam, 0 to 1 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 1 percent

Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Klayent and similar soils: 85 percent

Minor Components

Very poorly drained soils: 0 to 5 percent
 Very gravelly substratums: 0 to 5 percent
 Moderately well drained soils: 0 to 5 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Kobase Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans, stream terraces, small drainageways, lake plains, sedimentary plains
Parent material: Alluvium, glaciofluvial deposits, glaciolacustrine deposits
Slope range: 0 to 15 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Kobase silty clay loam, 0 to 4 percent slopes, in cropland, 100 feet south and 2,400 feet east of the northwest corner of sec. 8, T. 24 N., R. 8 E.

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

Bw—6 to 14 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores; strongly effervescent; mildly alkaline; clear wavy boundary.

Bk—14 to 25 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; few very fine and fine roots; many very fine tubular pores; common fine seams of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

By—25 to 46 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; sticky and plastic; many very fine tubular pores; many fine seams and common medium masses of gypsum; strongly effervescent; moderately alkaline; clear wavy boundary.

BCy—46 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; many very fine tubular pores; common fine seams of gypsum; slightly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 35 to 45 percent
Depth to the Bk horizon: 12 to 17 inches
Depth to the By horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: silty clay loam, clay loam
 Clay content: 35 to 40 percent
 Rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 0 to 2 mmhos/cm
 Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 1, 2, 3, or 4
 Texture: silty clay loam, silty clay, clay
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 5 percent pebbles
 Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 1, 2, 3, or 4
 Texture: silty clay loam, silty clay, clay
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0

By and BCy horizons

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, clay
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Gypsum content: 1 to 5 percent
 Reaction: pH 7.9 to 9.0

32B—Kobase silty clay loam, 0 to 4 percent slopes**Setting**

Landform: Lake plains
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Kobase and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 5 percent
 Marias and similar soils: 0 to 3 percent
 Clay loam till substratums: 0 to 3 percent
 Lonna and similar soils: 0 to 2 percent
 Yamacall, calcareous soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

32C—Kobase silty clay loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 4 to 8 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Kobase and similar soils: 85 percent

Minor Components

Lonna and similar soils: 0 to 5 percent
 Clay loam till substratums: 0 to 5 percent
 Ethridge and similar soils: 0 to 3 percent
 Yamacall, calcareous soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

32D—Kobase silty clay loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans

Slope: 8 to 15 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Kobase and similar soils: 85 percent

Minor Components

Yamacall, calcareous soils: 0 to 7 percent

Slopes less than 8 percent: 0 to 5 percent

Ethridge and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Kremlin Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans, stream terraces, small drainageways

Parent material: Glaciofluvial deposits

Slope range: 0 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Haploborolls

Typical Pedon

Kremlin loam, 0 to 4 percent slopes, in rangeland, 1,050 feet west and 250 feet south of the northeast corner of sec. 14, T. 23 N., R. 16 E.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure parting to strong very fine and fine granular; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; neutral; clear smooth boundary.

Bw—6 to 11 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; strong medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine and common fine tubular pores; mildly alkaline; clear smooth boundary.

Bk1—11 to 15 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; strong medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine tubular pores; common fine masses of lime; slightly effervescent; mildly alkaline; gradual wavy boundary.

Bk2—15 to 30 inches; light gray (10YR 7/2) clay loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BCk—30 to 60 inches; pale yellow (2.5Y 7/4) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; disseminated lime; violently effervescent; strongly alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches, in some pedons it includes all or part of the Bw horizon

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

Depth to the Bk horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 18 to 27 percent
 Rock fragments: 0 to 5 percent pebbles
 Reaction: pH 6.1 to 7.8

Bw horizon

Hue: 10YR or 2.5Y
 Value: 4, 5, or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: loam, clay loam
 Clay content: 18 to 30 percent
 Rock fragments: 0 to 5 percent pebbles
 Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Texture: loam, clay loam
 Clay content: 18 to 30 percent
 Rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Effervescence: strongly or violently
 Electrical conductivity: 0 to 2 mmhos/cm
 Reaction: pH 7.4 to 8.4

Bk2 and Bck horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, clay loam
 Clay content: 18 to 30 percent
 Rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 3 to 12 percent
 Effervescence: strongly or violently
 Electrical conductivity: 0 to 4 mmhos/cm
 Reaction: pH 7.4 to 8.4

98B—Kremlin loam, 0 to 4 percent slopes**Setting**

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Kremlin and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 5 percent
 Degrand and similar soils: 0 to 5 percent
 Kremlin sandy loam: 0 to 3 percent
 Chinook and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

98C—Kremlin loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans

Slope: 4 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Kremlin and similar soils: 85 percent

Minor Components

Yamacall, calcareous soils: 0 to 8 percent

Chinook and similar soils: 0 to 5 percent

Very gravelly surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Laceycreek Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans, stream terraces, drainageways, hills
Parent material: Alluvium from igneous rocks
Slope range: 2 to 25 percent
Annual precipitation: 17 to 24 inches
Annual air temperature: 40 to 44 degrees F
Frost-free period: 70 to 105 days

Taxonomic Class: Fine-loamy, mixed Pachic Udic Argiborolls

Typical Pedon

Laceycreek loam, 8 to 15 percent slopes, in cropland, 2,600 feet west and 2,000 feet south of the northeast corner of sec. 22, T. 21 N., R. 9 E.

Ap—0 to 5 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; strong fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; 10 percent pebbles; neutral; abrupt smooth boundary.

A2—5 to 18 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak medium subangular blocky structure parting to strong medium granular; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine and few fine tubular pores; 5 percent pebbles; neutral; clear wavy boundary.

Bt1—18 to 26 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky;

hard, very friable, sticky and plastic; few fine and very fine roots; many very fine and few fine tubular pores; common faint clay films on faces of peds; 5 percent pebbles; neutral; clear wavy boundary.

Bt2—26 to 44 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, sticky and plastic; few fine and very fine roots; many very fine and few fine and medium tubular pores; common distinct clay films on faces of peds; 5 percent pebbles; neutral; gradual wavy boundary.

2BC—44 to 60 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and few fine tubular pores; 15 percent pebbles; neutral.

Range in Characteristics

Mollic epipedon thickness: 16 to 60 inches
Content of clay in the control section: 24 to 35 percent
Rock fragments in the control section: 0 to 20 percent
Depth to the 2BC horizon: 40 inches or more

A1 horizon

Hue: 10YR, 2.5Y, or N
 Value: 3 or 4 dry; 2, 3, or N moist
 Chroma: 0 or 1
 Clay content: 15 to 24 percent
 Rock fragments: 0 to 15 percent—0 to 10 percent pebbles, 0 to 5 percent cobbles
 Reaction: pH 6.1 to 7.3

A2 horizon

Hue: 10YR, 2.5Y, or N
 Value: 3 or 4 dry, 2 or 3 moist
 Clay content: 15 to 24 percent
 Rock fragments: 0 to 15 percent—0 to 10 percent pebbles, 0 to 5 percent cobbles
 Reaction: pH 6.1 to 7.3

Bt1 horizon

Hue: 10YR or 2.5Y
 Value: 3, 4, or 5 dry; 3 moist
 Chroma: 2 or 3
 Texture: loam, clay loam
 Clay content: 24 to 35 percent
 Rock fragments: 0 to 10 percent—0 to 10 percent pebbles, 0 to 5 percent cobbles
 Reaction: pH 6.1 to 7.3

Bt2 horizon

Hue: 10YR or 2.5Y
 Value: 4 or 5 dry, 3 or 4 moist
 Chroma: 2 or 3
 Texture: loam, clay loam, sandy clay loam
 Clay content: 20 to 35 percent
 Rock fragments: 0 to 25 percent—0 to 20 percent pebbles, 0 to 5 percent cobbles
 Reaction: pH 6.6 to 7.3

2BC horizon

Hue: 10YR or 2.5Y
 Value: 4 or 5 dry, 3 or 4 moist
 Chroma: 2 or 3
 Texture: sandy loam, loam
 Clay content: 5 to 20 percent
 Rock fragments: 0 to 20 percent—0 to 15 percent pebbles, 0 to 5 percent cobbles
 Reaction: pH 6.6 to 7.3
 The Laceyreek soil in map units 650D and 650F is a taxadjunct to the series because the mollic epipedon has a chroma of 2. It classifies as fine-loamy, mixed Pachic Argiborolls.

110C—Laceyreek loam, 2 to 8 percent slopes**Setting**

Landform: Alluvial fans
Slope: 2 to 8 percent
Mean annual precipitation: 17 to 22 inches
Frost-free period: 90 to 105 days

Composition**Major Components**

Laceyreek and similar soils: 85 percent

Minor Components

Very gravelly substratums: 0 to 10 percent
 Very cobbly surface layers: 0 to 5 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

110D—Laceyreek loam, 8 to 15 percent slopes**Setting**

Landform: Alluvial fans
Slope: 8 to 15 percent
Mean annual precipitation: 17 to 22 inches
Frost-free period: 90 to 105 days

Composition**Major Components**

Laceyreek and similar soils: 85 percent

Minor Components

Very gravelly substratums: 0 to 8 percent
 Very cobbly surface layers: 0 to 5 percent
 Soils with a clay subsoil: 0 to 2 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

110E—Laceyreek loam, 15 to 25 percent slopes**Setting**

Landform: Alluvial fans
Slope: 15 to 25 percent

Mean annual precipitation: 17 to 22 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Laceycreek and similar soils: 85 percent

Minor Components

Very gravelly substratums: 0 to 10 percent
 Very cobbly surface layers: 0 to 3 percent
 Stony surface layers: 0 to 2 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

460—Laceycreek loam, 8 to 25 percent slopes, moist

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 8 to 25 percent
Mean annual precipitation: 17 to 22 inches
Frost-free period: 90 to 105 days

Composition

Major Components

Laceycreek and similar soils: 85 percent

Minor Components

Hedoes and similar soils: 0 to 5 percent
 Belain and similar soils: 0 to 3 percent
 Laceycreek, cool soils: 0 to 3 percent
 Soils with a clay subsoil: 0 to 2 percent

Eagleton and similar soils: 0 to 2 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

650D—Laceycreek-Ambrant complex, 4 to 15 percent slopes

Setting

Landform:
 * Laceycreek—Alluvial fans and stream terraces
 * Ambrant—Alluvial fans and stream terraces
Slope:
 * Laceycreek—4 to 15 percent
 * Ambrant—4 to 15 percent
Mean annual precipitation: 18 to 24 inches
Frost-free period: 70 to 100 days

Composition

Major Components

Laceycreek and similar soils: 55 percent
 Ambrant and similar soils: 35 percent

Minor Components

Winkler and similar soils: 0 to 8 percent
 Areas that occasionally flood: 0 to 2 percent

Major Component Description

Laceycreek

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 10.0 inches

Ambrant

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

650F—Laceycreek-Eaglecreek loams, 15 to 45 percent slopes

Setting

Landform:

* Laceycreek—Hills

* Eaglecreek—Hills

Position on landform:

* Laceycreek—Footslopes

* Eaglecreek—Backslopes and shoulders

Slope:

* Laceycreek—15 to 25 percent

* Eaglecreek—25 to 45 percent

Mean annual precipitation: 18 to 24 inches

Frost-free period: 70 to 100 days

Composition

Major Components

Laceycreek and similar soils: 45 percent

Eaglecreek and similar soils: 40 percent

Minor Components

Slopes more than 45 percent: 0 to 5 percent

Winkler and similar soils: 0 to 3 percent

Ambrant and similar soils: 0 to 2 percent

Whitlash and similar soils: 0 to 2 percent

Lodgepole pine trees: 0 to 2 percent

Areas of rock outcrop: 0 to 1 percent

Major Component Description

Laceycreek

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 10.0 inches

Eaglecreek

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Lambeth Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

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

Landform: Hills, escarpments

Parent material: Glaciolacustrine deposits

Slope range: 8 to 70 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

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

Typical Pedon

Lambeth silt loam, 8 to 25 percent slopes, in rangeland, 1,250 feet west and 1,000 feet north of the southeast corner of sec. 15, T. 24 N., R. 7 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; soft, very friable, sticky and plastic; many fine and common medium roots; few

pebbles on surface; strongly effervescent; mildly alkaline; clear smooth boundary.

- By1—4 to 14 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong thin platy structure; slightly hard, very friable, sticky and plastic; many fine and common medium roots; few very fine and fine tubular pores and common fine irregular pores; common medium masses of gypsum crystals between plates; strongly effervescent; mildly alkaline; clear wavy boundary.
- By2—14 to 20 inches; light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong thin platy structure; hard, very friable, sticky and plastic; few fine roots; few very fine and fine tubular pores; common fine masses of gypsum crystals; strongly effervescent; moderately alkaline; gradual wavy boundary.
- C—20 to 60 inches; grayish brown (2.5Y 5/2), light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong thin and medium laminar platy structure; hard, very friable, very sticky and very plastic; few very fine and fine tubular pores; few thin silty clay varves; few thin sandy loam varves below 40 inches; few fine masses of gypsum crystals in upper part; slightly effervescent; moderately alkaline.

Range in Characteristics

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

A horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 2, 3, or 4
Clay content: 20 to 27 percent
Reaction: pH 6.6 to 8.4

By and C horizons

Hue: 10YR, 2.5Y, or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: silt loam or silty clay loam with thin bands of loam, fine sandy loam, or very fine sandy loam
Clay content: 20 to 35 percent
Gypsum content: 1 to 6 percent
Calcium carbonate equivalent: 5 to 15 percent
Effervescence: strongly or violently
Reaction: pH 7.9 to 9.0

15E—Lambeth silt loam, 8 to 25 percent slopes

Setting

Landform: Hills
Slope: 8 to 25 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Lambeth and similar soils: 85 percent

Minor Components

Sunburst and similar soils: 0 to 5 percent
Busby and similar soils: 0 to 5 percent
Moderately saline soils: 0 to 2 percent
Slopes more than 25 percent: 0 to 2 percent
Areas that occasionally flood: 0 to 1 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

15F—Lambeth silt loam, 25 to 70 percent slopes

Setting

Landform: Escarpments
Slope: 25 to 70 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Lambeth and similar soils: 85 percent

Minor Components

Busby and similar soils: 0 to 5 percent
 Hillon and similar soils: 0 to 5 percent
 Bare, eroding soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Lardell Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Poorly drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 1 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed, frigid Aquollic Salorthids

Typical Pedon

Lardell silty clay, 0 to 1 percent slopes, in rangeland, 1,200 feet north and 1,100 feet east the southwest corner of sec. 16, T. 28 N., R. 13 E.

Az—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium granular structure; very hard, friable, very sticky and very plastic; few very fine roots; common fine masses of salts; slightly effervescent; very strongly alkaline; clear smooth boundary.

Bz—4 to 12 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; extremely hard,

firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; many fine masses of salts when dry; slightly effervescent; very strongly alkaline; clear wavy boundary.

BCz1—12 to 38 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, very sticky and very plastic; few very fine tubular pores; many fine masses of salt when dry; slightly effervescent; strongly alkaline; gradual wavy boundary.

BCz2—38 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay loam with strata of loam, silt loam, and fine sandy loam, olive brown (2.5Y 4/4) moist; massive; hard, friable, sticky and plastic; few very fine tubular pores; few to common fine masses of salt; slightly effervescent; strongly alkaline.

Range in Characteristics

Content of clay in the control section: 35 to 50 percent
Depth to seasonal water table: 12 to 36 inches
Depth to the salic horizon: Less than 30 inches

Az horizon

Hue: 10YR, 2.5Y, 5Y, or N
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 1 or 2
 Clay content: 40 to 55 percent
 Electrical conductivity: 16 to 30 mmhos/cm
 Sodium adsorption ratio: 8 to 50
 Reaction: pH 7.9 to 10.0

Bz and BCz1 horizons

Hue: 10YR, 2.5Y, 5Y, or N
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 1, 2, or 3
 Texture: silty clay loam, clay loam, silty clay, clay
 Clay content: 35 to 50 percent
 Electrical conductivity: 16 to 50 mmhos/cm
 Salt content: 2 to 3 percent
 Sodium adsorption ratio: 13 to 80
 Reaction: pH 8.5 to 10.0

BCz2 horizon

Hue: 10YR, 2.5Y, 5Y, or N
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 1, 2, 3, or 4
 Texture: silty clay loam, clay loam, silty clay, or clay that is stratified with silt loam to fine sandy loam
 Clay content: 30 to 45 percent
 Electrical conductivity: 16 to 50 mmhos/cm
 Salt content: 1 to 2 percent
 Sodium adsorption ratio: 30 to 60

Reaction: pH 8.5 to 10.0

The Lardell soil in map unit 63 is a taxadjunct to the series because it has 35 to 60 percent clay in the particle-size control section. It classifies as fine, mixed, frigid Aquollic Salorthids.

63—Lardell silty clay, 0 to 1 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 1 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Lardell and similar soils: 90 percent

Minor Components

Bigsag and similar soils: 0 to 5 percent

Poorly drained, ponded soils: 0 to 3 percent

Slightly saline soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Flooding: Rare

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodid within 30 inches

Available water capacity: Mainly 4.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Libeg Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Mountains

Parent material: Colluvium from igneous rocks

Slope range: 25 to 70 percent

Annual precipitation: 20 to 28 inches

Annual air temperature: 38 to 42 degrees F

Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed Argic Cryoborolls

Typical Pedon

Libeg cobbly loam, in a area of Libeg-Arrowpeak-Elkner complex, 25 to 70 percent slopes, in rangeland, 1,600 feet south and 150 feet east of the northwest corner of sec. 8, T. 20 N., R. 9 E.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) cobbly loam, very dark brown (10YR 2/2) moist; strong fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine and few medium roots; 20 percent cobbles, 10 percent pebbles; slightly acid; clear wavy boundary.

Bt1—8 to 14 inches; grayish brown (10YR 5/2) very cobbly loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure parting to strong medium granular; hard, very friable, slightly sticky and slightly plastic; many fine and very fine and few medium roots; many very fine tubular pores; few faint clay films on faces of peds; 25 percent cobbles, 20 percent pebbles; slightly acid; clear wavy boundary.

Bt2—14 to 32 inches; brown (10YR 5/3) extremely cobbly clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, friable, sticky and plastic; common fine and very fine and few medium roots; many very fine tubular pores; common faint clay films on faces of peds; 30 percent cobbles, 40 percent pebbles; slightly acid; gradual wavy boundary.

Bt3—32 to 48 inches; pale brown (10YR 6/3) very cobbly sandy clay loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine tubular pores; few faint clay films on faces of peds; 20 percent cobbles, 35 percent pebbles; slightly acid; gradual wavy boundary.

BC—48 to 60 inches; pale brown (10YR 6/3) very cobbly sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and

nonplastic; few fine and very fine roots; many very fine tubular pores; 20 percent cobbles, 30 percent pebbles; neutral.

Range in Characteristics

Rock fragments in the control section: 40 to 70 percent

A horizon

Hue: 7.5YR or 10YR
 Value: 3 or 4 dry, 2 or 3 moist
 Chroma: 1 or 2
 Clay content: 15 to 27 percent
 Rock fragments: 15 to 60 percent—0 to 50 percent stones and cobbles, 5 to 50 percent pebbles
 Reaction: pH 6.1 to 7.3

Bt1 and Bt2 horizons

Hue: 5YR, 7.5YR, or 10YR
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 2, 3, 4, or 6
 Texture: loam, sandy loam, clay loam
 Clay content: 15 to 35 percent
 Rock fragments: 35 to 80 percent—5 to 50 percent stones and cobbles, 10 to 45 percent pebbles
 Reaction: pH 6.1 to 7.3

Bt3 horizon

Hue: 5YR to 10YR
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 3, 4, or 6
 Texture: clay loam, sandy clay loam
 Clay content: 20 to 35 percent
 Rock fragments: 35 to 85 percent—5 to 50 percent stones and cobbles, 10 to 40 percent pebbles
 Reaction: pH 6.1 to 7.3

BC horizon

Hue: 5YR to 10YR
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 3, 4, or 6
 Texture: sandy loam, sandy clay loam, loam
 Clay content: 10 to 20 percent
 Rock fragments: 40 to 85 percent—10 to 50 percent stones and cobbles, 30 to 45 percent pebbles
 Reaction: pH 5.6 to 7.3

550F—Libeg-Arrowpeak-Elkner complex, 25 to 70 percent slopes

Setting

Landform:

* Libeg—Mountains

* Arrowpeak—Mountains

* Elkner—Mountains

Position on landform:

* Libeg—Backslopes and footslopes

* Arrowpeak—Shoulders and summits

* Elkner—Backslopes and footslopes

Slope:

* Libeg—25 to 70 percent

* Arrowpeak—25 to 70 percent

* Elkner—25 to 45 percent, northeast aspect

Mean annual precipitation: 20 to 28 inches

Frost-free period: 50 to 70 days

Composition

Major Components

Libeg and similar soils: 40 percent

Arrowpeak and similar soils: 25 percent

Elkner and similar soils: 20 percent

Minor Components

Garlet and similar soils: 0 to 4 percent

Moderately deep soils: 0 to 3 percent

Hedoes and similar soils: 0 to 2 percent

Stony surface layers: 0 to 2 percent

Areas of rock outcrop: 0 to 2 percent

Limber pine on south aspects: 0 to 2 percent

Major Component Description

Libeg

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Igneous colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.7 inches

Arrowpeak

Surface layer texture: Very cobbly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

Elkner

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Colluvium or residuum

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 5.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Lihen Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat excessively drained or well drained

Permeability: Rapid (6.0 to 20.0 inches/hour)

Landform: Stream terraces, sand dunes

Parent material: Alluvium, eolian deposits

Slope range: 0 to 10 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Sandy, mixed Entic Haploborolls

Typical Pedon

Lihen loamy fine sand, 0 to 6 percent slopes, in rangeland, 2,600 feet north and 300 feet west of the southeast corner of sec. 33, T. 27 N., R. 12 E.

A1—0 to 6 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; neutral; clear smooth boundary.

A2—6 to 12 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine tubular pores; neutral; clear wavy boundary.

Bk—12 to 17 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine irregular pores; few lime coatings on sand grains,

strongly effervescent; mildly alkaline; gradual wavy boundary.

BCk—17 to 40 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine and fine irregular pores; few lime coatings on sand grains; strongly effervescent; mildly alkaline; gradual wavy boundary.

C—40 to 60 inches; light brownish gray (10YR 6/2) loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; many very fine and fine irregular pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 12 to 18 inches

Content of clay in the control section: 0 to 10 percent

A horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: fine sandy loam, loamy fine sand

Clay content: 5 to 20 percent

Rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

An AB horizon is allowed

Bk, BCk horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loamy fine sand, loamy sand, fine sand, sand

Clay content: 0 to 10 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 2 to 15 percent

Structure: single grain, platy, prismatic, blocky

Effervescence: strongly or violently

Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: loamy fine sand, loamy sand, fine sand, sand

Clay content: 0 to 10 percent

Rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 0 to 12 percent

Effervescence: none to strongly

55B—Lihen loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Stream terraces

Slope: 0 to 6 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Lihen and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 5 percent

Lonesome and similar soils: 0 to 5 percent

Gravelly surface layers: 0 to 5 percent

Major Component Description

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Linnet Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Lake plains, till plains

Parent material: Glaciofluvial deposits, glaciolacustrine deposits

Slope range: 0 to 2 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Ustertic Argiborolls

Typical Pedon

Linnet silty clay, in an area of Scobey-Linnet complex, 0 to 4 percent slopes, in cropland, 1,700 feet north and 250 feet west of the southeast corner of sec. 22, T. 24 N., R. 3 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; strong very fine and fine granular structure; slightly hard, friable, sticky and plastic; common very fine roots; neutral; abrupt smooth boundary.

Bt—7 to 14 inches; brown (10YR 5/3) silty clay, dark brown (10YR 3/3) moist; strong fine and medium prismatic structure parting to strong fine and medium angular blocky; very hard, friable, sticky and very plastic; common very fine roots; common very fine tubular pores; many distinct clay films on faces of peds; clear wavy boundary.

Bkss—14 to 26 inches; pale brown (10YR 6/3) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium angular blocky; very hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; few thin clay films on faces of peds; few intersecting slickensides; few medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk—26 to 36 inches; pale brown (10YR 6/3) silty clay, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; common medium masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

BCy—36 to 55 inches; light brownish gray (10YR 6/2) stratified silty clay loam and clay loam, dark grayish brown (10YR 4/2) moist; moderate thin laminar platy structure; very hard, friable, sticky and plastic; common very fine tubular pores; common fine and medium threads and masses of gypsum crystals; strongly effervescent; strongly alkaline; gradual wavy boundary.

C—55 to 60 inches; grayish brown (10YR 5/2) stratified silty clay loam and clay loam, brown (10YR 4/3) moist; weak moderately thick and thick laminar platy structure; hard, friable, sticky and plastic; common very fine tubular pores; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches
Content of clay in the control section: 45 to 60 percent
Depth to the Bkss horizon: 12 to 18 inches

Ap horizon

Hue: 10YR or 2.5Y
 Chroma: 2 or 3
 Clay content: 40 to 45 percent
 Rock fragments: 0 to 10 percent pebbles
 Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2, 3, or 4
 Clay content: 45 to 60 percent
 Texture: clay loam, silty clay loam, clay, silty clay
 Rock fragments: 0 to 10 percent pebbles
 Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay, silty clay, silty clay loam
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Sodium adsorption ratio: 0 to 13
 Reaction: pH 7.4 to 8.4

BCy and C horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay, silty clay, clay loam, silty clay loam
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 15 percent pebbles
 Gypsum content: 1 to 5 percent
 Sodium adsorption ratio: 2 to 13
 Reaction: pH 7.9 to 9.0

34A—Linnet silty clay, 0 to 2 percent slopes

Setting

Landform: Lake plains
Slope: 0 to 2 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Linnet and similar soils: 85 percent

Minor Components

Acel and similar soils: 0 to 10 percent
 Scobey and similar soils: 0 to 3 percent
 Nishon and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

341B—Linnet-Marias silty clays, 0 to 4 percent slopes

Setting

Landform:

- * Linnet—Lake plains
- * Marias—Lake plains

Position on landform:

- * Linnet—Foothslopes and toeslopes
- * Marias—Backslopes and shoulders

Slope:

- * Linnet—0 to 2 percent
- * Marias—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Linnet and similar soils: 45 percent
 Marias and similar soils: 40 percent

Minor Components

Acel and similar soils: 0 to 10 percent
Kobase and similar soils: 0 to 5 percent

Major Component Description**Linnet**

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

Marias

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Linwell Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills
Parent material: Slope alluvium
Slope range: 15 to 45 percent
Annual precipitation: 17 to 19 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine, montmorillonitic Typic Haploborolls

Typical Pedon

Linwell clay loam, in an area of Linwell-Winifred clay loams, 15 to 45 percent slopes, in rangeland, 1,800 feet south and 1,100 feet east of the northwest corner of sec. 30, T. 20 N., R. 8 E.

A1—0 to 6 inches; dark gray (10YR 4/1) clay loam, black (10YR 2/1) moist; strong medium and coarse granular structure; hard, friable, sticky and plastic; many very fine and fine and few medium roots; neutral; clear wavy boundary.

A2—6 to 11 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure parting to strong fine subangular blocky; hard, friable, sticky and plastic; many very fine and fine and few medium roots; common very fine tubular pores; neutral; clear wavy boundary.

Bw—11 to 24 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, very sticky and very plastic; common very fine and few fine roots; common very fine tubular pores; moderately alkaline; clear wavy boundary.

Bk—24 to 31 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bck—31 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; common very fine tubular pores; common fine masses and threads of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches
Content of clay in the control section: 35 to 45 percent
Depth to the Bk horizon: 12 to 24 inches

A horizons

Hue: 10YR or 2.5Y
Value: 2 or 3 moist
Chroma: 1 or 2
Clay content: 30 to 40 percent
Rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

Bw horizon

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

Clay content: 35 to 45 percent
 Rock fragments: 0 to 10 percent pebbles
 Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: silty clay loam, clay loam, silty clay
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

BCK horizon

Hue: 7.5YR, 10YR through 5Y
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2, 3, or 4
 Mottles: none to few
 Texture: silty clay loam, clay loam, silty clay
 Clay content: 35 to 45 percent
 Rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 12 percent
 Reaction: pH 7.9 to 8.4
 Accumulation of gypsum is allowed below a depth of 24 inches

623F—Linwell-Winifred clay loams, 15 to 45 percent slopes

Setting

Landform:

- * Linwell—Hills
- * Winifred—Hills

Position on landform:

- * Linwell—Backslopes and footslopes
- * Winifred—Backslopes and shoulders

Slope:

- * Linwell—15 to 45 percent
- * Winifred—15 to 45 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Linwell and similar soils: 50 percent
 Winifred and similar soils: 35 percent

Minor Components

Wayden and similar soils: 0 to 5 percent
 Barkof and similar soils: 0 to 5 percent
 Amor and similar soils: 0 to 2 percent

Whitlash and similar soils: 0 to 1 percent
 Perma and similar soils: 0 to 1 percent
 Douglas-fir tree areas: 0 to 1 percent

Major Component Description

Linwell

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.3 inches

Winifred

Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Lonesome Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Rapid (6.0 to 20.0 inches/hour) to 32 inches; below this depth slow (0.06 to 0.2 inch/hour)
Landform: Till plains, stream terraces, lake plains
Parent material: Eolian or eolian deposits over till or lacustrine material
Slope range: 0 to 6 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Sandy over loamy, mixed (calcareous), frigid Aridic Ustorthents

Typical Pedon

Lonesome loamy fine sand, 0 to 6 percent slopes, in cropland, 1,200 feet west and 350 feet north of the southeast corner of sec. 22, T. 28 N., R. 11 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine and moderate granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; neutral; abrupt smooth boundary.

A2—6 to 12 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; neutral; clear wavy boundary.

Bw1—12 to 20 inches; brown (10YR 5/3) fine sand, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; many very fine tubular pores; neutral; gradual wavy boundary.

Bw2—20 to 32 inches; brown (10YR 5/3) fine sand, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic, many very fine tubular pores; neutral; abrupt wavy boundary.

2Bk1—32 to 43 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine tubular pores; common fine and medium masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

2Bk2—43 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine tubular pores; few fine and medium masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to the 2Bk horizon: 20 to 35 inches

Ap and A2 horizons

Hue: 10YR or 2.5Y
Value: 4 or 5 dry, 3 or 4 moist
Chroma: 2, 3, or 4
Clay content: 5 to 15 percent
Rock fragments: 0 to 2 percent pebbles
Reaction: pH 6.6 to 7.8

Bw horizons

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3, 4, or 5 moist
Chroma: 3 or 4
Texture: loamy fine sand, loamy sand, fine sand

Clay content: 5 to 15 percent
Rock fragments: 0 to 2 percent
Reaction: pH 6.6 to 7.8

2Bk horizons

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2, 3, or 4
Texture: clay loam, loam, silty clay loam (contains less than 50 percent fine or coarser sand)
Clay content: 20 to 35 percent
Rock fragments: 0 to 5 percent
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 0 to 4 mmhos/cm
Sodium adsorption ratio: 0 to 13
Reaction: pH 7.9 to 9.0

551B—Lonesome loamy fine sand, 0 to 6 percent slopes

Setting

Landform: Till plains and lake plains

Slope: 0 to 6 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Lonesome and similar soils: 85 percent

Minor Components

Chinook and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

Fortbenton and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Eolian over till or lacustrine material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Lonna Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans, stream terraces, lake plains, small drainageways

Parent material: Glaciofluvial deposits, glaciolacustrine deposits

Slope range: 0 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

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

Typical Pedon

Lonna silty clay loam, 0 to 4 percent slopes, in cropland, 500 feet south and 1,100 feet west of the northeast corner of sec. 5, T. 24 N., R. 5 E.

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

Bw—6 to 11 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk—11 to 22 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; common fine and few medium masses of lime; violently effervescent; moderately alkaline; clear wavy boundary.

By—22 to 34 inches; grayish brown and light brownish gray (2.5Y 5/2 and 2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; common fine and medium masses of gypsum; slightly effervescent; moderately alkaline; clear wavy boundary.

BC—34 to 60 inches; grayish brown and light brownish gray (10YR 5/2 and 10YR 6/2) silty clay loam, brown (10YR 5/3) moist; thin and very thin laminar platy structure; very hard, friable, sticky and plastic; common very fine tubular pores; slightly effervescent; moderately alkaline.

Range in Characteristics

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

Ap horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam, silty clay loam

Clay content: 18 to 35 percent

Effervescence: slightly or strongly

Reaction: pH 7.4 to 8.4

Uncultivated areas have A horizons 2 to 4 inches thick

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: silt loam, silty clay loam

Clay content: 18 to 35 percent

Effervescence: slightly or strongly

Reaction: pH 7.4 to 8.4

Bk and *By* 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, silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 1 to 13

Effervescence: strongly or violently

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: very fine sandy loam, loam, silt loam, silty clay loam (may be stratified)

Clay content: 10 to 35 percent

Electrical conductivity: 2 to 16 mmhos/cm

Sodium adsorption ratio: 10 to 20

Effervescence: strongly or violently

Reaction: pH 7.9 to 9.0

58B—Lonna silty clay loam, 0 to 4 percent slopes**Setting***Landform:* Lake plains*Slope:* 0 to 4 percent*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Lonna and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 8 percent

Yamacall, calcareous soils: 0 to 5 percent

Fine sandy loam substratums: 0 to 2 percent

Major Component Description*Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Glaciolacustrine deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.3 inches**Management**

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

58C—Lonna silty clay loam, 4 to 8 percent slopes**Setting***Landform:* Alluvial fans, stream terraces and drainageways*Slope:* 4 to 8 percent*Mean annual precipitation:* 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Lonna and similar soils: 85 percent

Minor Components

Ethridge and similar soils: 0 to 5 percent

Yamacall, calcareous soils: 0 to 5 percent

Chinook and similar soils: 0 to 5 percent

Major Component Description*Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Glaciofluvial deposits*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.3 inches**Management**

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Lubrecht Series*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Permeability:* Slow (0.06 to 0.2 inch/hour)*Landform:* Mountains*Parent material:* Residuum from shale*Slope range:* 8 to 35 percent*Annual precipitation:* 18 to 22 inches*Annual air temperature:* 40 to 43 degrees F*Frost-free period:* 70 to 100 days**Taxonomic Class:** Fine, mixed Glossic Eutroboralfs**Typical Pedon**

Lubrecht loam, in an area of Crow-Lubrecht loams, 8 to 35 percent slopes, in forest, 2,100 feet south and 800 feet east of the northwest corner of sec. 9, T. 28 N., R. 15 E.

O—2 inches to 0; slightly decomposed forest litter.

A—0 to 4 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; strong fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine, very fine and few medium roots; neutral; clear smooth boundary.

E—4 to 6 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to strong fine subangular blocky; slightly hard, very friable,

sticky and plastic; many fine and very fine roots; many very fine tubular pores; neutral; clear wavy boundary.

Bt/E—6 to 12 inches; Bt part (60 percent) grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; E part (40 percent) is light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very hard, firm, sticky and plastic; common fine and very fine roots; many very fine tubular pores; neutral; clear wavy boundary.

Bt1—12 to 22 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong medium and coarse prismatic structure parting to strong medium subangular blocky; extremely hard, very firm, very sticky and very plastic; common fine and very fine roots; common very fine tubular pores; many distinct clay films on faces of peds; neutral; gradual wavy boundary.

Bt2—22 to 33 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to strong medium subangular blocky; extremely hard, very firm, very sticky and very plastic; few fine and very fine roots; common very fine tubular pores; many faint clay films on faces of peds; neutral; clear wavy boundary.

Cr—33 to 60 inches; grayish brown (10YR 5/2) shale, dark grayish brown (10YR 4/2) moist.

Range in Characteristics

Content of clay in the control section: 38 to 55 percent

Depth to bedrock: 20 to 40 inches

E horizon

Value: 5 or 6 dry, 4 or 5 moist

Clay content: 10 to 27 percent

Texture: loam, clay loam, silt loam

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 5.1 to 7.3

Bt/E horizon

Value: B part 5 or 6, E part 6 or 7 dry; B part 4 or 5, E part 4, 5, or 6 moist

Chroma: B part 2, 3, or 4; E part 2, 3, or 4

Texture: silty clay loam, clay loam

Clay content, mixed: 27 to 40 percent

Reaction: pH 5.6 to 7.3

Bt1 and Bt2 horizons

Hue: 10YR or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: silty clay, clay

Clay content: 40 to 60 percent

Reaction: pH 5.6 to 7.3

Macar Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans, stream terraces, hills

Parent material: Alluvium or slope alluvium from sandstone and shale

Slope range: 0 to 35 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

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

Typical Pedon

Macar loam, 4 to 8 percent slopes, in cropland, 1,300 feet north and 1,300 feet east of the southwest corner of sec. 13, T. 22 N., R. 10 E.

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

Bw—6 to 15 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots; many very fine and few fine tubular pores; few fine masses of lime; strongly effervescent; mildly alkaline; clear wavy boundary.

Bk1—15 to 30 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots; many very fine and few fine tubular pores; common fine seams and masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—30 to 45 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; common fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk3—45 to 60 inches; pale brown (10YR 6/3) clay loam with strata of loam, brown (10YR 5/3) moist; weak fine and medium subangular structure; hard, friable, slightly sticky and slightly plastic; many very fine tubular pores; common fine masses of lime; strongly effervescent; strongly alkaline.

Range in Characteristics

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

Depth to the Bk horizon: 11 to 18 inches

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Clay content: 18 to 27 percent

Rock fragments: 0 to 30 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles

Effervescence: none to slightly

Reaction: pH 6.6 to 8.4

A thin dark colored A horizon that does not meet the requirements for a mollic epipedon after mixing to 7 inches is allowed

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, 4, or 6

Texture: loam, clay loam, silty clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Effervescence: none to slightly

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, 4, or 6

Texture: clay loam, loam, silty clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Effervescence: slightly or strongly

Calcium carbonate equivalent: 8 to 15 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, 4, or 6

Texture: clay loam, loam, silt loam, sandy clay loam, or silty clay loam (some fine strata of sandy loam and fine sandy loam are in some pedons)

Clay content: 15 to 30 percent with 35 to 55 percent fine sand and coarser

Rock fragments: 0 to 10 percent pebbles

Effervescence: strongly or violently

Calcium carbonate equivalent: 5 to 12 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

96B—Macar loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Macar and similar soils: 85 percent

Minor Components

Macar calcareous soils: 0 to 8 percent

Sagedale and similar soils: 0 to 5 percent

Tally and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

96C—Macar loam, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans

Slope: 4 to 8 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition**Major Components**

Macar and similar soils: 85 percent

Minor Components

Macar calcareous soils: 0 to 8 percent

Sagedale and similar soils: 0 to 5 percent

Tally and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Marcott Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat poorly drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Alluvial fans, stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 125 days

Taxonomic Class: Fine, mixed Aquic Haploborolls

Typical Pedon

Marcott silty clay loam, 0 to 3 percent slopes, in hayland, 1,320 feet east and 1,400 feet south of the northwest corner of sec. 9, T. 21 N., R. 10 E.

Ap—0 to 4 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; strong fine subangular blocky structure; hard, firm, very sticky and very plastic; many fine and very fine roots; mildly alkaline; clear smooth boundary.

Bw—4 to 15 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; strong fine subangular blocky structure; hard, firm, very sticky and very plastic; common very fine roots; common very fine tubular pores; mildly alkaline; gradual wavy boundary.

Bk—15 to 20 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; few fine faint yellow (10YR 7/6) mottles; moderate to medium prismatic structure parting to moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; common medium masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkg—20 to 30 inches; gray and light gray (10YR 5/1 and 6/1) silty clay loam, dark gray (10YR 4/1) moist; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; common very fine tubular pores; many medium masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BCkg—30 to 60 inches; gray and light gray (10YR 5/1 and 6/1) silty clay loam, dark gray (10YR 4/1) moist; many fine distinct yellowish brown (10YR 5/6) mottles; massive; very hard, very firm, very sticky and very plastic; many medium masses of lime; violently effervescent; strongly alkaline.

Range in Characteristics

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

Depth to seasonal water table: 24 to 48 inches

Depth to the Bk horizon: 12 to 24 inches

Soil phases: Saline

Ap horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 1 or 2

Clay content: 35 to 40 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm, saline phase 4 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 20

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 1, 2, or 3
 Texture: clay loam, silty clay loam, silty clay, clay
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 2 to 8 mmhos/cm; saline phase 8 to 16 mmhos/cm
 Sodium adsorption ratio: 0 to 25
 Calcium carbonate equivalent: 0 to 2 percent
 Reaction: pH 7.4 to 8.4

Bk, Bkg, and BCkg horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 1, 2, or 3
 Texture: clay loam, silty clay loam, silty clay, or clay
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
 Electrical conductivity: 4 to 8 mmhos/cm, saline phase 8 to 16 mmhos/cm
 Sodium adsorption ratio: 0 to 30
 Calcium carbonate equivalent: 3 to 15 percent
 Reaction: pH 7.4 to 9.0

324B—Marcott silty clay loam, 0 to 3 percent slopes**Setting**

Landform: Alluvial fans and stream terraces
Slope: 0 to 3 percent
Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition**Major Components**

Marcott and similar soils: 85 percent

Minor Components

Strongly saline soils: 0 to 5 percent
 Soils with loamy profiles: 0 to 3 percent
 Klayent and similar soils: 0 to 3 percent
 Areas that rarely flood: 0 to 2 percent
 Stratified loam to sand soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 8.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

2B—Marcott-Bigsandy complex, 0 to 4 percent slopes**Setting****Landform:**

- * Marcott—Alluvial fans and stream terraces
- * Bigsandy—Flood plains

Slope:

- * Marcott—0 to 4 percent
- * Bigsandy—0 to 2 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 125 days

Composition**Major Components**

Marcott and similar soils: 50 percent
 Bigsandy and similar soils: 35 percent

Minor Components

Savage and similar soils: 0 to 3 percent
 Gravelly substratums: 0 to 5 percent
 Poorly drained, sandy soils: 0 to 5 percent
 Shambo and similar soils: 0 to 2 percent

Major Component Description**Marcott**

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Salt affected: Saline within 30 inches
Available water capacity: Mainly 6.8 inches

Big sandy

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Flooding: Occasional
Water table: Apparent
Salt affected: Saline within 30 inches
Available water capacity: Mainly 4.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Marias Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Lake plains
Parent material: Glaciolacustrine deposits
Slope range: 0 to 8 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid
 Chromic Udic Haplusterts

Typical Pedon

Marias silty clay, 0 to 4 percent slopes, in cropland, 1,280 feet west and 200 feet north of the southeast corner of sec. 5, T. 26 N., R. 5 E.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate very fine and fine granular structure; slightly hard, friable, sticky and plastic; many very fine and fine roots; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bw—6 to 12 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bkss—12 to 38 inches; light brownish gray (2.5Y 6/2)

silty clay, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; few fine threads of lime; common intersecting slickensides; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bssy—38 to 60 inches; light yellowish brown (2.5Y 6/4) silty clay, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, very sticky and very plastic; few very fine tubular pores; common slickensides; many medium masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 40 to 60 percent
Depth to the Bssy horizon: 20 to 45 inches

Ap horizon

Hue: 10YR, 2.5Y, 5Y
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 1, 2, or 3
 Clay content: 40 to 60 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 1 to 4
 Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay, silty clay
 Clay content: 40 to 60 percent
 Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 1 to 4
 Reaction: pH 7.9 to 8.4

Bkss horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Texture: clay, silty clay
 Clay content: 40 to 60 percent
 Slickensides: common or many
 Electrical conductivity: 0 to 4 mmhos/cm
 Sodium adsorption ratio: 1 to 4
 Reaction: pH 7.9 to 8.4

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: clay or silty clay
 Clay content: 40 to 60 percent
 Gypsum content: 1 to 6 percent

Electrical conductivity: 2 to 4 mmhos/cm above a depth of 30 inches and 2 to 8 mmhos/cm below
Sodium adsorption ratio: 1 to 4 above 30 inches and 4 to 13 below
Reaction: pH 7.9 to 9.0

47B—Marias silty clay, 0 to 4 percent slopes

Setting

Landform: Lake plains
Slope: 0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Marias and similar soils: 85 percent

Minor Components

Kobase and similar soils: 0 to 6 percent
Ethridge and similar soils: 0 to 5 percent
Moderately saline soils: 0 to 3 percent
Poorly drained soils: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

47C—Marias silty clay, 4 to 8 percent slopes

Setting

Landform: Lake plains
Slope: 4 to 8 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Marias and similar soils: 85 percent

Minor Components

Kobase and similar soils: 0 to 5 percent
Ethridge and similar soils: 0 to 5 percent
Clay loam till substratums: 0 to 3 percent
Moderately saline soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

471B—Marias-Kobase complex, 0 to 4 percent slopes

Setting

Landform:
* Marias—Lake plains
* Kobase—Lake plains
Position on landform:
* Marias—Foothills and toeslopes
* Kobase—Backslopes and shoulders
Slope:
* Marias—0 to 4 percent
* Kobase—0 to 4 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Marias and similar soils: 45 percent
Kobase and similar soils: 40 percent

Minor Components

Acel and similar soils: 0 to 5 percent

Clay loam till substratums: 0 to 5 percent
 Slopes more than 4 percent: 0 to 4 percent
 Poorly drained soils: 0 to 1 percent

Major Component Description

Marias

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.5 inches

Kobase

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Marmarth Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Sedimentary plains
Parent material: Residuum from interbedded sandstone and shale
Slope range: 2 to 8 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Marmarth loam, 2 to 8 percent slopes, in cropland, 2,200 feet north and 2,150 feet east of the southwest corner of sec. 11, T. 24 N., R. 10 E.

Ap—0 to 7 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; strong fine granular structure, slightly hard, very friable, sticky and plastic; few very fine roots; neutral; abrupt smooth boundary.

Bt—7 to 11 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, sticky and plastic; few very fine roots; common very fine tubular pores; common faint clay films on faces of peds; neutral, clear wavy boundary.

Bk1—11 to 17 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, sticky and plastic; few very fine roots; common very fine tubular pores; common fine threads of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—17 to 30 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure; very friable, sticky and slightly plastic; few very fine roots; common very fine tubular pores; common fine threads of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—30 to 60 inches; light yellowish brown (2.5Y 6/4) interbedded sandstone and shale, light olive brown (2.5Y 5/4) moist; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches and may include all or part of the Bt horizon
Content of clay in the control section: 18 to 35 percent
Depth to bedrock: 20 to 40 inches
Depth to the Bk horizon: 8 to 16 inches

A horizon

Hue: 10YR
 Value: 3, 4, or 5 moist
 Chroma: 2 or 3
 Clay content: 20 to 27 percent
 Reaction: pH 6.6 to 7.3

Bt horizon

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

Clay content: 18 to 35 percent
Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 2.5Y or 5Y
Value: 5, 6, or 7 dry; 4, 5, or 6 moist
Chroma: 2 to 4
Texture: loam, fine sandy loam, clay loam
Clay content: 15 to 30 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

422C—Marmarth loam, 2 to 8 percent slopes**Setting**

Landform: Sedimentary plains
Slope: 2 to 8 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition**Major Components**

Marmarth and similar soils: 85 percent

Minor Components

Evanston and similar soils: 0 to 5 percent
Delpoint and similar soils: 0 to 5 percent
Joplin and similar soils: 0 to 3 percent
Cabbart and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Martinsdale Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour)
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 0 to 15 percent
Annual precipitation: 14 to 19 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 120 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Martinsdale loam, in an area of Martinsdale-Turner loams, 0 to 2 percent slopes, in rangeland, 1,200 feet north and 1,800 feet west of the southeast corner of sec. 1, T. 21 N., R 9 E.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; strong medium granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and medium roots; 5 percent pebbles; neutral; clear smooth boundary.

Bt1—4 to 11 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, sticky and plastic; many fine roots and common medium roots; common fine and very fine tubular pores; many distinct clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

Bt2—11 to 18 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate fine subangular blocky; hard, very friable, sticky and plastic; common fine and very fine roots; common fine and very fine tubular pores; many faint clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

Bk—18 to 25 inches; light gray (10YR 7/2) clay loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; hard, friable, sticky and slightly plastic; common fine and very fine roots; many fine and very fine tubular pores; few pebbles; disseminated lime; violently effervescent; moderately alkaline; clear wavy boundary.

BCK1—25 to 40 inches; white (10YR 8/2) clay loam, light gray (10YR 7/2) moist; massive; slightly hard, friable, sticky and slightly plastic; few fine and very fine roots; many fine and very fine tubular pores; few pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BCK2—40 to 60 inches; light brownish gray (10YR 6/2) gravelly loam, brown (10YR 5/3) moist; massive; slightly hard, friable, sticky and slightly plastic; many fine and very fine tubular pores; 20 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches and includes all or part of the Bt1 horizon

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

Rock fragments in the control section: 0 to 15 percent

Depth to the Bk horizon: 11 to 30 inches

Soil phases: Stony

A horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Rock fragments: 0 to 25 percent—0 to 10 percent cobbles, 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bt1 horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2, 3, or 4

Texture: sandy clay loam, loam, clay loam

Clay content: 25 to 35 percent

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

Reaction: pH 6.6 to 8.4

Bt2 horizon

Hue: 7.5YR or 10YR

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

Chroma: 3 or 4

Texture: loam, clay loam, sandy clay loam

Clay content: 25 to 35 percent

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

Reaction: pH 6.6 to 8.4

Bk, BCK1, and BCK2 horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam, clay loam, sandy clay loam, sandy loam, gravelly loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 35 percent

Rock fragments: 0 to 25 percent—0 to 5 percent cobbles, 0 to 20 percent pebbles

Reaction: pH 7.4 to 8.4

511C—Martinsdale loam, 2 to 8 percent slopes

Setting

Landform: Relict stream terraces

Position on landform: Treads

Slope: 2 to 8 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Martinsdale and similar soils: 85 percent

Minor Components

Turner and similar soils: 0 to 10 percent

Tally and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

512C—Martinsdale stony loam, 4 to 15 percent slopes

Setting

Landform: Relict stream terraces

Position on landform: Treads

Slope: 4 to 15 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Martinsdale and similar soils: 85 percent

Minor Components

Very stony surface layers: 0 to 4 percent

Slopes more than 15 percent: 0 to 5 percent

Turner and similar soils: 0 to 3 percent

Very cobbly soils: 0 to 2 percent

Bouldery surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

511A—Martinsdale-Turner loams, 0 to 2 percent slopes

Setting

Landform:

* Martinsdale—Relict stream terraces

* Turner—Relict stream terraces

Position on landform:

* Martinsdale—Treads

* Turner—Treads

Slope:

* Martinsdale—0 to 2 percent

* Turner—0 to 2 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Martinsdale and similar soils: 50 percent

Turner and similar soils: 35 percent

Minor Components

Beaverton and similar soils: 0 to 10 percent

Very cobbly surface layers: 0 to 5 percent

Major Component Description

Martinsdale

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.5 inches

Turner

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Marvan Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Alluvial fans, stream terraces, sedimentary plains

Parent material: Alluvium

Slope range: 0 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Sodic Haplusterts

Typical Pedon

Marvan clay, 0 to 4 percent slopes, in rangeland, 700 feet east and 2,500 feet south of the northwest corner of sec. 23, T. 23 N., R. 16 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; hard, friable, very sticky and very plastic; common very fine and fine roots; moderately alkaline; clear smooth boundary.

Bss—3 to 18 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure; very hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; few intersecting slickensides; slightly effervescent; strongly alkaline; clear wavy boundary.

Bssy—18 to 46 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, sticky and very plastic; few very fine and fine roots; common very fine tubular pores; few slickensides; common fine and medium masses of gypsum; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bnyz—46 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, sticky and very plastic; few very fine roots; common very fine tubular pores; common fine and medium masses of gypsum and other salts; slightly effervescent; moderately alkaline.

Range in Characteristics

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

Depth to the Bssy horizon: 10 to 24 inches

Soil phases: Saline

A horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay, silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm; saline phase is 2 to 8 mmhos/cm

Sodium adsorption ratio: 8 to 18 above a depth of 24 inches and 13 to 38 below that depth (Where the SAR is 8 or less, the sodium plus magnesium is greater than calcium plus acidity)

Reaction: pH 7.4 to 9.0

Bss horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay, silty clay

Clay content: 45 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 4 to 38 (Where the SAR is below 8, the sodium plus magnesium is greater than calcium plus acidity)

Reaction: pH 7.9 to 9.0

Bssy horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay, silty clay

Clay content: 45 to 60 percent

Gypsum content: 1 to 5 percent

Electrical conductivity: 2 to 16 mmhos/cm

Sodium adsorption ratio: 8 to 18 above a depth of 24 inches and 13 to 38 below that depth (Where the SAR is below 8, the sodium plus magnesium is greater than calcium plus acidity)

Reaction: pH 7.9 to 9.0

Bnyz horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay or silty clay that includes thin layers of silty clay loam and silt loam material

Clay content: 45 to 60 percent

Gypsum content: 1 to 5 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 38

Reaction: pH 7.9 to 9.0

30B—Marvan clay, 0 to 4 percent slopes**Setting**

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Marvan and similar soils: 85 percent

Minor Components

Vanda and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 4 percent

Kobase and similar soils: 0 to 3 percent

Clay loam till substratums: 0 to 3 percent

Major Component Description

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

30C—Marvan clay, 4 to 8 percent slopes**Setting**

Landform: Alluvial fans

Slope: 4 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Marvan and similar soils: 85 percent

Minor Components

Vanda and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 5 percent

Kobase and similar soils: 0 to 3 percent

Areas that occasionally flood: 0 to 2 percent

Major Component Description

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

305A—Marvan-Nobe clays, 0 to 2 percent slopes**Setting**

Landform:

* Marvan—Stream terraces

* Nobe—Stream terraces

Position on landform:

* Marvan—Microlows

* Nobe—Microhighs

Slope:

* Marvan—0 to 2 percent

* Nobe—0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Marvan and similar soils: 55 percent

Nobe and similar soils: 35 percent

Minor Components

Stratified, loamy soils: 0 to 5 percent

Somewhat poorly drained soils: 0 to 3 percent

Areas that occasionally flood: 0 to 2 percent

Major Component Description

Marvan

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.5 inches

Nobe

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

301A—Marvan-Vanda clays, 0 to 2 percent slopes

Setting

Landform:

- * Marvan—Alluvial fans and stream terraces
- * Vanda—Alluvial fans and stream terraces

Slope:

- * Marvan—0 to 2 percent
- * Vanda—0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Marvan and similar soils: 50 percent
 Vanda and similar soils: 35 percent

Minor Components

Slightly saline soils: 0 to 10 percent
 Benz and similar soils: 0 to 5 percent

Major Component Description

Marvan

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.0 inches

Vanda

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

301C—Marvan-Vanda clays, 2 to 8 percent slopes

Setting

Landform:

- * Marvan—Alluvial fans
- * Vanda—Alluvial fans

Slope:

- * Marvan—2 to 8 percent
- * Vanda—2 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Marvan and similar soils: 50 percent
 Vanda and similar soils: 35 percent

Minor Components

Slightly saline soils: 0 to 5 percent
 Benz and similar soils: 0 to 5 percent

Bascovy and similar soils: 0 to 3 percent
Clay loam till substratums: 0 to 2 percent

Major Component Description

Marvan

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.0 inches

Vanda

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Mcllwaine Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour) to 26 inches, below this depth rapid (6.0 to 20.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 115 days

Taxonomic Class: Coarse-loamy over sandy or sandy-skeletal, mixed Cumulic Haploborolls

Typical Pedon

Mcllwaine fine sandy loam, in an area of Mcllwaine-Nesda-Straw complex, 0 to 2 percent slopes, in

hayland, 100 feet north and 1,600 feet west of the southeast corner of sec. 8, T. 20 N., R. 8 E.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; strong fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many fine and very fine roots; 5 percent pebbles; neutral; abrupt smooth boundary.

A2—6 to 15 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; strong medium granular structure; slightly hard, very friable, slightly sticky and nonplastic; many fine and very fine roots; 5 percent pebbles; neutral; clear wavy boundary.

A3—15 to 26 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common fine and very fine roots; many very fine tubular pores; 5 percent pebbles; neutral; clear wavy boundary.

2C1—26 to 45 inches; dark gray (10YR 4/1) very gravelly loamy sand, very dark gray (10YR 3/1) moist; single grain; loose, nonsticky and nonplastic; few fine and very fine roots; many very fine irregular pores; 40 percent pebbles, 10 percent cobbles; neutral; gradual wavy boundary.

2C2—43 to 60 inches; dark gray (10YR 4/1) extremely gravelly sand, very dark gray (10YR 3/1) moist; single grain; loose, nonsticky and nonplastic; many fine and very fine irregular pores; 50 percent pebbles, 20 percent cobbles; neutral.

Range in Characteristics

Depth to the 2C horizon: 20 to 40 inches

Soil phases: Occasionally flooded

Ap horizon

Value: 3, 4, or 5 dry; 2 or 3 moist
Clay content: 5 to 18 percent
Rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.6 to 7.3

A2 horizon

Value: 3, 4, or 5 dry; 2 or 3 moist
Texture: fine sandy loam, sandy loam, loam
Clay content: 5 to 18 percent
Rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.6 to 7.3

A3 horizon

Value: 4 or 5 dry, 3 moist
Texture: fine sandy loam, sandy loam, loam

Clay content: 5 to 18 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 7.3

2C1 and 2C2 horizons

Hue: 2.5Y or 10YR
 Value: 4 or 5 dry, 3 or 4 moist
 Chroma: 1 or 2
 Texture: loamy sand, sand, loamy coarse sand,
 coarse sand
 Clay content: 0 to 5 percent
 Rock fragments: 35 to 80 percent—25 to 50
 percent pebbles, 10 to 30 percent cobbles
 Reaction: pH 6.6 to 7.8

180A—Mcllwaine-Nesda-Straw complex, 0 to 2 percent slopes

Setting

Landform:

- * Mcllwaine—Flood plains
- * Nesda—Flood plains
- * Straw—Flood plains

Slope:

- * Mcllwaine—0 to 2 percent
- * Nesda—0 to 2 percent
- * Straw—0 to 2 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Mcllwaine and similar soils: 45 percent
 Nesda and similar soils: 25 percent
 Straw and similar soils: 20 percent

Minor Components

Very cobbly surface layers: 0 to 5 percent
 Areas that occasionally flood: 0 to 3 percent
 Poorly drained soils: 0 to 2 percent

Major Component Description

Mcllwaine

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 3.7 inches

Nesda

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 3.4 inches

Straw

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Megonot Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains, hills
Parent material: Residuum from interbedded shale and sandstone
Slope range: 0 to 60 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Aridic Ustochrepts

Typical Pedon

Megonot clay loam, in an area Megonot-Kobase-Delpoint complex, 2 to 8 percent slopes, in cropland, 1,000 feet west and 1,900 feet south of the northeast corner of sec. 10, T. 25 N., R. 16 E.

Ap—0 to 6 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium granular structure; hard, friable, sticky and plastic; many fine and very fine roots; mildly alkaline; abrupt smooth boundary.

Bw—6 to 11 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; few fine and very fine roots; common very fine tubular pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk—11 to 26 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, very sticky and very plastic; few very fine roots; common very fine tubular pores; common fine and medium masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—26 to 60 inches; light brownish gray (2.5Y 6/2) shale, dark grayish brown (2.5Y 4/2) moist; strongly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 35 to 45 percent

Depth to the Bk horizon: 10 to 15 inches

Depth to the Cr horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay loam, clay loam

Clay content: 35 to 45 percent

Rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay loam, clay loam, silty clay

Clay content: 35 to 45 percent

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

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: silty clay loam, clay loam, silty clay

Clay content: 35 to 45 percent

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

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

142C—Megonot-Kobase-Delpoint complex, 2 to 8 percent slopes

Setting

Landform:

* Megonot—Sedimentary plains

* Kobase—Sedimentary plains

* Delpoint—Sedimentary plains

Position on landform:

* Megonot—Backslopes and shoulders

* Kobase—Footslopes

* Delpoint—Backslopes and shoulders

Slope:

* Megonot—2 to 8 percent

* Kobase—2 to 8 percent

* Delpoint—2 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Megonot and similar soils: 40 percent

Kobase and similar soils: 30 percent

Delpoint and similar soils: 20 percent

Minor Components

Ethridge and similar soils: 0 to 3 percent

Yawdim and similar soils: 0 to 2 percent

Cabbart and similar soils: 0 to 2 percent

Slopes more than 8 percent: 0 to 2 percent

Weingart and similar soils: 0 to 1 percent

Major Component Description

Megonot

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.5 inches

Kobase

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

141B—Megonot-Weingart-Delpoint complex, 0 to 4 percent slopes**Setting***Landform:*

- * Megonot—Sedimentary plains
- * Weingart—Sedimentary plains
- * Delpoint—Sedimentary plains

Position on landform:

- * Megonot—Backslopes and footslopes
- * Weingart—Microlows
- * Delpoint—Backslopes and shoulders

Slope:

- * Megonot—0 to 4 percent
- * Weingart—0 to 2 percent
- * Delpoint—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Megonot and similar soils: 40 percent
 Weingart and similar soils: 25 percent
 Delpoint and similar soils: 25 percent

Minor Components

Kobase and similar soils: 0 to 3 percent
 Strongly saline/sodic soils: 0 to 3 percent
 Ethridge and similar soils: 0 to 2 percent
 Yamacall and similar soils: 0 to 2 percent

Major Component Description**Megonot**

Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

Weingart

Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.4 inches

Delpoint

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

182F—Megonot-Yawdim silty clay loams, 25 to 60 percent slopes**Setting***Landform:*

- * Megonot—Hills
- * Yawdim—Hills

Position on landform:

- * Megonot—Backslopes and footslopes
- * Yawdim—Backslopes and shoulders

Slope:

- * Megonot—25 to 60 percent
- * Yawdim—25 to 60 percent

Mean annual precipitation: 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Megonot and similar soils: 45 percent
 Yawdim and similar soils: 40 percent

Minor Components

Very deep, clayey soils: 0 to 8 percent
 Delpoint and similar soils: 0 to 3 percent
 Yamacall and similar soils: 0 to 2 percent
 Areas of rock outcrop: 0 to 2 percent

Major Component Description**Megonot**

Surface layer texture: Silty clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

Yawdim

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

M-W—Miscellaneous Water**Composition****Major Components**

Miscellaneous water: 100 percent

Major Component Description

Definition: Areas of open water in sewage lagoons, industrial waste pits, fish hatcheries, etc.

Neldore Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Sedimentary plains, hills, escarpments
Parent material: Residuum from shale
Slope range: 2 to 70 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Clayey, montmorillonitic, nonacid, frigid, shallow Aridic Ustorthents

Typical Pedon

Neldore silty clay, in an area of Neldore-Rock outcrop complex, 25 to 70 percent slopes, in rangeland, 1,200 feet west and 500 feet north of the southeast corner of sec. 6, T. 24 N., R. 8 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; hard, friable, sticky and plastic; common fine roots; common fine masses of gypsum; mildly alkaline; clear wavy boundary.

C—4 to 15 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate thin platy structure; very hard, friable, very sticky and very plastic; common fine roots; common very fine tubular pores; 20 percent soft thin shale chips; common fine masses of gypsum; mildly alkaline; clear wavy boundary.

Cr—15 to 60 inches; grayish brown (2.5Y 5/2) and light brownish gray (2.5Y 6/2) shale, dark grayish brown

(2.5Y 4/2) moist; few medium masses of gypsum crystals between plates; neutral.

Range in Characteristics

Content of clay in the control section: 40 to 60 percent
Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 4, 5, or 6 dry; 3, 4, or 5 moist
Chroma: 1 or 2
Clay content: 40 to 50 percent
Rock fragments: 0 to 10 percent—0 to 5 percent stones and cobbles, 0 to 5 percent pebbles
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 5.6 to 7.8

C horizon

Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 1 or 2
Texture: clay or silt clay
Clay content: 40 to 60 percent
Rock fragments: 5 to 35 percent—5 to 25 percent soft shale fragments, 0 to 10 percent hard shale fragments
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 5.6 to 7.8

971F—Neldore-Bascovy silty clays, 25 to 60 percent slopes

Setting

Landform:

- * Neldore—Hills
- * Bascovy—Hills

Position on landform:

- * Neldore—Backslopes and shoulders
- * Bascovy—Backslopes and footslopes

Slope:

- * Neldore—25 to 60 percent
- * Bascovy—25 to 45 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Neldore and similar soils: 45 percent
Bascovy and similar soils: 40 percent

Minor Components

Very deep, loamy soils: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Calcareous soils: 0 to 3 percent
Saline and sodic soils: 0 to 1 percent
Ponderosa pine (eastern part): 0 to 1 percent

Major Component Description

Neldore

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Bascovy

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

974F—Neldore-Hillon complex, 25 to 70 percent slopes

Setting

Landform:

- * Neldore—Escarpments
- * Hillon—Escarpments

Position on landform:

- * Neldore—Backslopes and footslopes
- * Hillon—Backslopes and shoulders

Slope:

- * Neldore—25 to 70 percent
- * Hillon—25 to 70 percent

Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Neldore and similar soils: 55 percent
 Hillon and similar soils: 30 percent

Minor Components

Lambeth and similar soils: 0 to 5 percent
 Sunburst and similar soils: 0 to 3 percent
 Bascovy and similar soils: 0 to 3 percent
 Areas of rock outcrop: 0 to 3 percent
 Tinsley and similar soils: 0 to 1 percent

Major Component Description

Neldore

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Hillon

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

972F—Neldore-Rock outcrop complex, 25 to 70 percent slopes

Setting

Landform:

- * Neldore—Hills
- * Rock outcrop—Escarpments

Slope: 25 to 70 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

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

Minor Components

Bascovy and similar soils: 0 to 5 percent
 Yetull and similar soils: 0 to 3 percent
 Slopes less than 25 percent: 0 to 3 percent
 Strongly saline, shallow soils: 0 to 2 percent
 Yamac and similar soils: 0 to 2 percent

Major Component Description

Neldore

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

Rock outcrop

Definition: Exposures of shale bedrock

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Nesda Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: In the upper 12 inches moderate (0.6 to 2.0 inches/hour) or moderately rapid (2.0 to 6.0 inches/hour), below this depth rapid (6.0 to 20.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Annual precipitation: 15 to 19 inches

Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 115 days

Taxonomic Class: Sandy-skeletal, mixed Fluventic
 Haploborolls

Typical Pedon

Nesda loam, in an area of Nesda-McIlwaine complex, 0 to 2 percent slopes, in pasture, 300 feet east and 600 feet north of the southwest corner of sec. 11, T. 21 N., R. 7 E.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; mildly alkaline; clear smooth boundary.

A2—5 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine and fine tubular pores; mildly alkaline; clear smooth boundary.

2C1—12 to 23 inches; dark gray (10YR 4/1) very gravelly sand, very dark gray (10YR 3/1) moist; single grain; loose, nonsticky and nonplastic; many fine irregular pores; 40 percent pebbles, 5 percent cobbles; mildly alkaline; gradual wavy boundary.

2C2—23 to 60 inches; dark grayish brown (10YR 4/2) very gravelly loamy sand, very dark grayish brown (10YR 3/2) moist; single grain, loose, nonsticky and nonplastic; many fine irregular pores; 45 percent pebbles, 10 percent cobbles; mildly alkaline.

Range in Characteristics

Mollic epipedon thickness: 10 to 16 inches
Content of clay in the control section: 0 to 10 percent
Rock fragments in the control section: 35 to 80 percent
Depth to the 2C horizon: 10 to 20 inches
Soil phases: Rarely flooded, occasionally flooded

A1 and A2 horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 3, 4, or 5 dry; 2 or 3 moist

Chroma: 1, 2, or 3
 Texture: loam, sandy loam
 Clay content: 10 to 20 percent
 Rock fragments: 0 to 65 percent—0 to 15 percent stones and cobbles, 0 to 50 percent pebbles
 Reaction: pH 6.6 to 7.8

2C1 and 2C2 horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 4, 5, 6, or 7 dry; 3, 4, or 5 moist
 Chroma: 1, 2, 3, or 4
 Texture: sand, loamy sand
 Clay content: 0 to 10 percent
 Rock fragments: 35 to 80 percent—0 to 15 percent stones and cobbles, 35 to 65 percent pebbles
 Reaction: pH 7.4 to 8.4

130A—Nesda-McIlwaine complex, 0 to 2 percent slopes

Setting

Landform:

- * Nesda—Flood plains
- * Nesda—Flood plains
- * McIlwaine—Flood plains

Slope:

- * Nesda—0 to 2 percent
- * Nesda—0 to 2 percent
- * McIlwaine—0 to 2 percent

Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 115 days

Composition

Major Components

Nesda and similar soils: 35 percent
 Nesda and similar soils: 20 percent
 McIlwaine and similar soils: 30 percent

Minor Components

Poorly drained soils: 0 to 5 percent
 Rarely flooded rangeland soils: 0 to 3 percent
 Enbar and similar soils: 0 to 3 percent
 Areas that frequently flood: 0 to 2 percent
 Farnuf soils on alluvial fans: 0 to 1 percent
 Savage soils on alluvial fans: 0 to 1 percent

Major Component Description

Nesda

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Occasional
Available water capacity: Mainly 3.6 inches

Nesda

Surface layer texture: Very gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Occasional
Available water capacity: Mainly 2.8 inches

Mcllwaine

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Occasional
Available water capacity: Mainly 4.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Nishon Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Poorly drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Closed depressions
Parent material: Alluvium
Slope range: 0 to 1 percent
Annual precipitation: 11 to 17 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 100 to 125 days

Taxonomic Class: Fine, montmorillonitic, frigid Typic Albaqualfs

Typical Pedon

Nishon clay loam, 0 to 1 percent slopes, in cropland, 2,300 feet north and 1,200 feet east of the southwest corner of sec. 33, T. 26 N., R. 14 E.

Ap—0 to 6 inches; gray (10YR 5/1) clay loam, dark gray (10YR 4/1) moist; few distinct brown (10YR 5/3) dry mottles; moderate thin platy structure; very hard, friable, sticky and plastic; few very fine and fine roots; common fine and very fine vesicular and tubular pores; neutral; abrupt smooth boundary.

E—6 to 8 inches; light gray (10YR 6/1) clay loam, dark gray (10YR 4/1) moist; few distinct brown (10YR 5/3) dry mottles; moderate medium prismatic structure parting to strong fine subangular blocky; extremely hard, firm, very sticky and very plastic; few fine and very fine roots; few very fine tubular pores; common unstained sand grains on faces of peds; neutral; clear wavy boundary.

Bt—8 to 31 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; few faint grayish brown (2.5Y 5/2) dry mottles; moderate medium prismatic structure parting to strong fine subangular blocky; extremely hard, very firm, very sticky and very plastic; few fine and very fine roots; few very fine tubular pores; common faint clay films on faces of peds; neutral; clear wavy boundary.

Bk1—31 to 44 inches; light gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; extremely hard, very firm, very sticky and very plastic; few very fine tubular pores; few fine threads and masses of lime; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—44 to 60 inches; light olive gray (5Y 6/2) clay loam, olive gray (5Y 4/2) moist; few faint light yellowish brown (2.5Y 6/4) dry mottles; weak coarse prismatic structure; extremely hard, firm, sticky and plastic; few very fine tubular pores; common fine threads and medium masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 40 to 60 percent

Depth to seasonal water table: Ponded to 36 inches

Depth to the Bk horizon: 16 to 34 inches

Ap and E horizons

Hue: 2.5Y or 10YR

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

Chroma: 1 or 2

Mottles: few to common (Hue: 10YR 5/3, 4/3)

Clay content: 27 to 35 percent

Reaction: pH 6.1 to 8.4

Bt horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 0, 1, or 2

Mottles: few to common (Hue: 10YR 5/3, 4/3, or 2.5Y 5/2, 5/3)

Texture: clay, silty clay

Clay content: 40 to 60 percent

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 2.5Y or 5Y

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

Chroma: 0, 1, 2, or 3

Mottles: few to common (Hue: 10YR 4/4, 6/4 moist)

Texture: clay loam, clay, or silty clay

Clay content: 35 to 55 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: 7.4 to 9.0

28—Nishon clay loam, 0 to 1 percent slopes

Setting

Landform: Closed depressions

Slope: 0 to 1 percent

Mean annual precipitation: 11 to 17 inches

Frost-free period: 100 to 125 days

Composition

Major Components

Nishon and similar soils: 90 percent

Minor Components

Soils with clay surface layers: 0 to 3 percent

Moderately well drained soils: 0 to 3 percent

Moderately sodic soils: 0 to 2 percent

Strongly saline soils: 0 to 1 percent

Artificially drained areas: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Ponding: Long

Available water capacity: Mainly 9.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Nobe Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Moderately well drained or well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Alluvial fans, stream terraces, flood plains, small drainageways

Parent material: Alluvium, glaciofluvial deposits

Slope range: 0 to 4 percent

Annual precipitation: 11 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Oxyaquic Ustorthents

Typical Pedon

Nobe silty clay, in an area of Absher-Nobe complex, 0 to 4 percent slopes, in rangeland, 300 feet south and 500 feet west of the northeast corner of sec. 20, T. 27. N., R. 5 E.

E—0 to 1 inch; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; vesicular crust; very hard, firm, sticky and plastic; few very fine and fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

By—1 to 9 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and very

plastic; few very fine roots; common very fine tubular pores; strongly effervescent; common fine and medium masses of gypsum; strongly alkaline; clear wavy boundary.

Byz1—9 to 20 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate very fine and fine granular (flocculated) structure; hard, friable, very sticky and very plastic; few fine seams of gypsum and other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

Byz2—20 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; common very fine tubular pores; common fine and medium masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

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

Depth to seasonal water table: 48 to 72 inches for rarely flooded and occasionally flooded phases

Depth to maximum zone of the salt accumulation: 8 to 16 inches

Soil phases: Rarely flooded, occasionally flooded

E horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: loam, clay loam, silty clay loam, silty clay, clay

Clay content: 20 to 50 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 13

Reaction: pH 6.6 to 8.4

By and Byz1 horizons

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: clay, silty clay, silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 30 mmhos/cm

Gypsum content: 1 to 6 percent

Sodium adsorption ratio: 13 to 40 percent

Reaction: pH 7.9 to 9.6

Byz2 horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2 or 3

Texture: clay, silty clay, or silty clay loam that is

stratified with loam, clay loam, and silt loam

Clay content: 35 to 60 percent

Electrical conductivity: 16 to 30 mmhos/cm

Gypsum content: 1 to 6

Sodium adsorption ratio: 13 to 70

Reaction: pH 7.9 to 9.6

Norbert Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Hills

Parent material: Residuum from shale

Slope range: 25 to 60 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents

Typical Pedon

Norbert silty clay, in an area of Norbert-Barkof silty clays, 25 to 60 percent slopes, in rangeland, 2,000 feet south and 2,600 feet east of the northwest corner of sec. 13, T. 21 N., R. 8 E.

A—0 to 5 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; very hard, friable, very sticky and very plastic; common very fine and fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk—5 to 12 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine and fine roots, common very fine tubular pores; few fine seams of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bky—12 to 18 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; few very fine roots; common very fine tubular pores; 30 percent soft shale chips; common fine threads and masses of lime; few fine masses of gypsum; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—18 to 60 inches; grayish brown (2.5Y 5/2) shale, dark grayish brown (2.5Y 4/2) moist; many seams of gypsum; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 50 to 60 percent
Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 2.5Y or 5Y
Value: 5 or 6 dry, 4 or 5 moist
Chroma: 1 or 2
Clay content: 45 to 60 percent
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 2.5Y or 5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: clay, silty clay
Clay content: 50 to 60 percent
Rock fragments: 0 to 20 percent shale fragments—
0 to 5 percent hard shale, 0 to 15 percent soft shale
Electrical conductivity: 2 to 4 mmhos/cm
Calcium carbonate equivalent: 2 to 12 percent
Reaction: pH 7.4 to 8.4

Bky horizon

Hue: 2.5Y or 5Y
Value: 4, 5, or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: clay, silty clay
Clay content: 50 or 60 percent
Rock fragments: 5 to 30 percent shale fragments—
0 to 5 percent hard shale, 5 to 25 percent soft shale
Electrical conductivity: 2 to 4 mmhos/cm
Calcium carbonate equivalent: 5 to 15 percent
Gypsum content: 1 to 3 percent
Reaction: pH 7.4 to 8.4

641F—Norbert-Barkof silty clays, 25 to 60 percent slopes

Setting

Landform:

- * Norbert—Hills
- * Barkof—Hills

Position on landform:

- * Norbert—Backslopes and shoulders
- * Barkof—Backslopes and footslopes

Slope:

- * Norbert—25 to 60 percent
- * Barkof—25 to 45 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Norbert and similar soils: 45 percent
Barkof and similar soils: 40 percent

Minor Components

Very deep, clayey soils: 0 to 5 percent
Areas of rock outcrop: 0 to 3 percent
Noncalcareous soils: 0 to 3 percent
Soils with clay loam profiles: 0 to 2 percent
Slopes less than 25 percent: 0 to 2 percent

Major Component Description

Norbert

Surface layer texture: Silty clay
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.7 inches

Barkof

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Pendroy Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Lake plains

Parent material: Glaciolacustrine deposits

Slope range: 0 to 2 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Very-fine, montmorillonitic, frigid
Chromic Udic Haplusterts

Typical Pedon

Pendroy clay, 0 to 2 percent slopes, in cropland, 2,500 feet west and 2,450 feet south of the northeast corner of sec. 34, T. 23 N., R. 3 E.

Ap—0 to 5 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; strong very fine and fine granular structure; hard, firm, very sticky and very plastic; many very fine and fine roots; slightly effervescent; mildly alkaline; abrupt smooth boundary.

Bss1—5 to 14 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine angular blocky structure; extremely hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; 1- to 3-inch wide vertical cracks that are 6 to 18 inches apart; well expressed slickensides on all surfaces of cracks that intersect at 30 to 60 degree angles; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bss2—14 to 30 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse angular blocky structure; extremely hard, very firm, very sticky and very plastic; common very fine and fine roots; few very fine tubular pores; 1/2-inch wide vertical cracks that are 6 to 18 inches apart; well expressed slickensides on all surfaces of cracks that intersect at 30 to 60 degree angles; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bss3—30 to 44 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, very sticky and very plastic; few very fine roots; few very fine tubular pores; well expressed slickensides on all surfaces of cracks that intersect at 30 to 60 degree angles; slightly effervescent; moderately alkaline; gradual wavy boundary.

BCy—44 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very

plastic; few very fine roots; few very fine pores; few fine and medium masses of gypsum; slightly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 60 to 75 percent

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: 60 to 75 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

Bss horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay, silty clay

Clay content: 60 to 75 percent

Electrical conductivity: 2 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

BCy horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: silty clay, clay

Clay content: 50 to 65 percent

Electrical conductivity: 2 to 4 mmhos/cm

Gypsum content: 2 to 6 percent

Reaction: pH 7.9 to 8.4

43A—Pendroy clay, 0 to 2 percent slopes

Setting

Landform: Lake plains

Slope: 0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Pendroy and similar soils: 85 percent

Minor Components

Kobase and similar soils: 0 to 6 percent

Ethridge and similar soils: 0 to 5 percent

Slopes more than 2 percent: 0 to 3 percent

Poorly drained soils: 0 to 1 percent

Major Component Description

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciolacustrine deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Perma Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat excessively drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to 28 inches, below this depth moderately rapid (2.0 to 6.0 inches/hour)

Landform: Mountains, alluvial fans

Parent material: Colluvium or alluvium from igneous rocks

Slope range: 2 to 70 percent

Annual precipitation: 17 to 22 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed Typic Haploborolls

Typical Pedon

Perma cobbly loam, in an area of Perma-Whitlash complex, 25 to 70 percent slopes, in rangeland, 1,450 feet north and 1,400 feet east of the southwest corner of sec. 5, T. 28 N., R. 15 E.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) cobbly loam, black (10YR 2/1) moist; strong fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; many very fine and fine pores; 15 percent cobbles; neutral; clear wavy boundary.

A2—7 to 15 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine pores; 20 percent pebbles, 15 percent cobbles; neutral; clear wavy boundary.

Bw1—15 to 28 inches; light brownish gray (10YR 6/2) very cobbly loam, dark grayish brown (10YR 4/2) moist; weak fine subangular structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; common very fine and fine pores; 30 percent pebbles, 25 percent cobbles; neutral; gradual wavy boundary.

Bw2—28 to 42 inches; light brownish gray (2.5Y 6/2) extremely cobbly loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots; common very fine and fine pores; 30 percent pebbles, 50 percent cobbles; neutral; clear wavy boundary.

BC—42 to 60 inches; light gray (2.5Y 7/2) extremely cobbly loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine and fine pores; disseminated lime; 30 percent pebbles, 50 percent cobbles; many distinct lime casts on underside of fragments; strongly effervescent; mildly alkaline.

Range in Characteristics

Mollic epipedon thickness: 10 to 15 inches

Content of clay in the control section: 7 to 20 percent

A horizons

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Clay content: 7 to 20 percent

Rock fragments: 15 to 60 percent—0 to 30 percent cobbles, stones, and boulders; 10 to 50 percent pebbles

Reaction: pH 6.6 to 7.3

Bw horizons

Hue: 2.5Y, 10YR, or 7.5YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: loam, sandy loam

Clay content: 7 to 27 percent

Rock fragments: 35 to 85 percent—0 to 50 percent cobbles and stones, 25 to 65 percent pebbles

Reaction: pH 6.6 to 7.8

BC horizon

Hue: 2.5Y, 10YR, or 7.5YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: loam, loamy sand, sandy loam

Clay content: 0 to 15 percent

Rock fragments: 60 to 85 percent—10 to 50

percent cobbles and stones, 50 to 65 percent pebbles
Reaction: pH 6.6 to 7.8

88C—Perma gravelly loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Mean annual precipitation: 17 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Perma and similar soils: 85 percent

Minor Components

Hedoes and similar soils: 0 to 7 percent
Flaggy surface layers: 0 to 3 percent
Very cobbly surface layers: 0 to 2 percent
Slopes more than 8 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

883F—Perma-Whitlash complex, 25 to 70 percent slopes

Setting

Landform:
* Perma—Mountains
* Whitlash—Mountains
Position on landform:
* Perma—Backslopes and footslopes
* Whitlash—Backslopes and shoulders

Slope:

- * Perma—25 to 70 percent
- * Whitlash—25 to 70 percent

Mean annual precipitation: 17 to 22 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Perma and similar soils: 50 percent
Whitlash and similar soils: 35 percent

Minor Components

Belain and similar soils: 0 to 3 percent
Very stony surface layers: 0 to 3 percent
Douglas-fir or ponderosa pine: 0 to 3 percent
Hedoes and similar soils: 0 to 2 percent
Very deep, sandy soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Perma

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Igneous colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.8 inches

Whitlash

Surface layer texture: Very cobbly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Phillips Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Till plains

Parent material: Glacial till

Slope range: 0 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic
Eutroboralfs

Typical Pedon

Phillips loam, in an area of Phillips-Elloam complex, 0 to 4 percent slopes, in cropland, 1,600 feet north and 1,500 feet east of the southwest corner of sec. 24, T. 28 N., R. 12 E.

Ap—0 to 4 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; slightly acid; clear smooth boundary.

E—4 to 8 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; moderate fine and medium prismatic structure; hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; neutral; abrupt smooth boundary.

Bt—8 to 15 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; strong fine and medium prismatic structure parting to moderate fine subangular blocky; very hard, firm, sticky and plastic; many very fine and fine roots; common very fine tubular pores; many distinct clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk1—15 to 24 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; common fine and many very fine roots; many very fine tubular pores; many fine masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—24 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores;

common fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bck—32 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; many very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 35 to 45 percent
Depth to the Bk horizon: 12 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 dry, 3 or 4 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

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

Reaction: pH 6.1 to 7.3

E horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: loam, sandy loam

Clay content: 15 to 27 percent

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

Reaction: pH 6.1 to 7.3

Some pedons have an E/B horizon

Bt horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: clay loam, clay

Clay content: 35 to 45 percent

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

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 8.4

Bk1, Bk2, and Bck horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam, clay loam

Clay content: 25 to 40 percent

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

Electrical conductivity: 0 to 8 mmhos/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Sodium adsorption ratio: 0 to 13
 Reaction: pH 7.4 to 8.4

33A—Phillips loam, 0 to 2 percent slopes

Setting

Landform: Till plains
Slope: 0 to 2 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Phillips and similar soils: 85 percent

Minor Components

Kevin and similar soils: 0 to 5 percent
 Elloam and similar soils: 0 to 4 percent
 Thoeny and similar soils: 0 to 3 percent
 Slopes more than 2 percent: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

331B—Phillips-Elloam complex, 0 to 4 percent slopes

Setting

Landform:
 * Phillips—Till plains
 * Elloam—Till plains

Position on landform:

- * Phillips—Microhighs
- * Elloam—Microlows

Slope:

- * Phillips—0 to 4 percent
- * Elloam—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Phillips and similar soils: 55 percent
 Elloam and similar soils: 30 percent

Minor Components

Absher and similar soils: 0 to 6 percent
 Kevin and similar soils: 0 to 6 percent
 Soils with shale substratums: 0 to 2 percent
 Nishon and similar soils: 0 to 1 percent

Major Component Description

Phillips

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.5 inches

Elloam

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

331C—Phillips-Elloam complex, 4 to 8 percent slopes

Setting

Landform:

- * Phillips—Till plains
- * Elloam—Till plains

Position on landform:

- * Phillips—Microhighs
- * Elloam—Microlows

Slope:

- * Phillips—4 to 8 percent
- * Elloam—4 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Phillips and similar soils: 55 percent
Elloam and similar soils: 30 percent

Minor Components

Absher and similar soils: 0 to 8 percent
Hillon and similar soils: 0 to 6 percent
Nishon and similar soils: 0 to 1 percent

Major Component Description

Phillips

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Elloam

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

334B—Phillips-Kevin complex, 0 to 4 percent slopes

Setting

Landform:

- * Phillips—Till plains
- * Kevin—Till plains

Position on landform:

- * Phillips—Foothills and toeslopes
- * Kevin—Backslopes and shoulders

Slope:

- * Phillips—0 to 2 percent
- * Kevin—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Phillips and similar soils: 50 percent
Kevin and similar soils: 35 percent

Minor Components

Hillon and similar soils: 0 to 8 percent
Elloam and similar soils: 0 to 6 percent
Nishon and similar soils: 0 to 1 percent

Major Component Description

Phillips

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.5 inches

Kevin

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Reeder Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Hills
Parent material: Interbedded sandstone and shale residuum
Slope range: 8 to 25 percent
Annual precipitation: 15 to 19 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 115 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Reeder loam, in an area of Farnuf-Reeder loams, 4 to 15 percent slopes, in rangeland, 1,600 feet south and 2,500 feet east of the northwest corner of sec. 9, T. 20 N., R. 11 E.

A—0 to 7 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; strong fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine and few medium roots; neutral; clear smooth boundary.

Bt—7 to 12 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine and few medium roots; common very fine tubular pores; common distinct clay films on faces of peds; neutral; clear smooth boundary.

Bk1—12 to 20 inches; light brownish gray (2.5Y 6/2) clay loam, light olive brown (2.5Y 5/4) moist; weak

medium prismatic structure parting to moderate fine subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine roots; many very fine tubular pores; common fine masses and threads of lime; strongly effervescent; mildly alkaline; clear wavy boundary.

Bk2—20 to 34 inches; pale yellow (2.5Y 7/4) clay loam, light olive brown (2.5Y 5/4) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; many fine and medium masses and threads of lime; violently effervescent; mildly alkaline; gradual wavy boundary.

Cr—34 to 60 inches; pale yellow (2.5Y 7/4) platy sandstone, light olive brown (2.5Y 5/4) moist; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches (may include all or part of the Bt horizon)

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

Depth to the Bk horizon: 10 to 26 inches

Depth to the Cr horizon: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Clay content: 15 to 27 percent

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 7.5YR, 10YR, or 2.5Y

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

Chroma: 2 to 4

Texture: loam, sandy clay loam, clay loam

Clay content: between 20 and 30 percent, but ranges from 18 to 35 percent and from 20 to 45 percent fine sand and coarser

Reaction: pH 6.6 to 7.8

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, silty clay loam, clay loam, sandy clay loam

Clay content: 15 to 30 percent

Calcium carbonate equivalent: 6 to 20 percent

Reaction: pH 7.4 to 8.4

411E—Reeder-Farnuf loams, 8 to 25 percent slopes

Setting

Landform:

- * Reeder—Hills
- * Farnuf—Hills

Position on landform:

- * Reeder—Backslopes and shoulders
- * Farnuf—Foothills

Slope:

- * Reeder—15 to 25 percent
- * Farnuf—8 to 15 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Reeder and similar soils: 50 percent
Farnuf and similar soils: 35 percent

Minor Components

Cabba and similar soils: 0 to 3 percent
Vebar and similar soils: 0 to 3 percent
Stony surface layers: 0 to 3 percent
Tally and similar soils: 0 to 2 percent
Whitlash and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Reeder

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Interbedded sandstone and shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.6 inches

Farnuf

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

2—Riverwash

Setting

Landform: Flood plains

Composition

Major Components

Riverwash: 85 percent

Minor Components

Areas that frequently flood: 0 to 10 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Definition: Unstabilized areas of sandy, silty, clayey, or gravelly sediments

Rivra Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Rapid (6.0 to 20.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 2 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Aridic Ustifluvents

Typical Pedon

Rivra sandy loam, in an area of Rivra-Hanly complex, 0 to 2 percent slopes, in woodland, 600 feet east and 2,100 feet south of the northwest corner of sec. 18, T. 24 N., R. 8 E.

A1—0 to 2 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, slightly

sticky and slightly plastic; common very fine, fine and coarse roots; 5 percent pebbles; slightly effervescent; mildly alkaline; abrupt smooth boundary.

A2—2 to 6 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine and few coarse roots; many very fine and fine pores; 5 percent pebbles; slightly effervescent; mildly alkaline; clear wavy boundary.

C1—6 to 15 inches; pale brown (10YR 6/3) extremely gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; many fine pores; 15 percent cobbles, 50 percent pebbles; slightly effervescent; mildly alkaline; gradual wavy boundary.

C2—15 to 60 inches; pale brown (10YR 6/3) extremely gravelly sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few very fine and fine roots in the upper 20 inches; many very fine pores; 10 percent cobbles, 60 percent pebbles; slightly effervescent; mildly alkaline.

Range in Characteristics

Content of clay in the control section: 0 to 5 percent
Rock fragments in the control section: 55 to 80 percent

A horizons

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 5 to 15 percent
Rock fragments: 0 to 35 percent—0 to 10 percent stones and cobbles, 0 to 25 percent pebbles
Reaction: pH 6.6 to 8.4

C horizons

Hue: 10YR or 2.5Y
Value: 5, 6, or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: sand, loamy coarse sand that consists of stratification of these and some finer sands
Clay content: 0 to 5 percent
Rock fragments: 55 to 80 percent—10 to 20 percent stones and cobbles, 45 to 70 percent pebbles
Reaction: pH 7.4 to 8.4

99—Rivra-Hanly complex, 0 to 2 percent slopes

Setting

Landform:

- * Rivra—Flood plains
- * Hanly—Flood plains

Slope:

- * Rivra—0 to 2 percent
- * Hanly—0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Rivra and similar soils: 50 percent
Hanly and similar soils: 35 percent

Minor Components

Glendive and similar soils: 0 to 3 percent
Soils in rangeland: 0 to 3 percent
Poorly drained soils: 0 to 3 percent
Havre and similar soils: 0 to 2 percent
Very gravelly surface layers: 0 to 2 percent
Areas of riverwash: 0 to 2 percent

Major Component Description

Rivra

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Occasional
Available water capacity: Mainly 2.2 inches

Hanly

Surface layer texture: Loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forest land
Flooding: Occasional
Available water capacity: Mainly 5.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

510—Rock outcrop-Belain complex, 15 to 45 percent slopes

Setting

Landform:

- * Rock outcrop—Escarpments
- * Belain—Hills

Slope:

- * Belain—15 to 45 percent

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

- Rock outcrop: 45 percent
- Belain and similar soils: 40 percent

Minor Components

- Whitlash and similar soils: 0 to 5 percent
- Very stony surface layers: 0 to 5 percent
- Hedoes and similar soils: 0 to 3 percent
- Perma and similar soils: 0 to 2 percent

Major Component Description

Rock outcrop

Definition: Exposures of igneous bedrock

Belain

Surface layer texture: Sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

410—Rock outcrop-Fleak complex, 25 to 70 percent slopes

Setting

Landform:

- * Rock outcrop—Escarpments
- * Fleak—Hills

Slope:

- * Fleak—25 to 70 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

- Rock outcrop: 55 percent
- Fleak and similar soils: 30 percent

Minor Components

- Twilight and similar soils: 0 to 5 percent
- Limber pine, rocky mountain juniper: 0 to 5 percent
- Cabbart and similar soils: 0 to 3 percent
- Yamacall and similar soils: 0 to 2 percent

Major Component Description

Rock outcrop

Definition: Exposures of sandstone bedrock

Fleak

Surface layer texture: Loamy fine sand
Depth class: Shallow (10 to 20 inches)
Drainage class: Excessively drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Roy Series

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

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

Landform: Alluvial fans, relict stream terraces

Parent material: Alluvium

Slope range: 2 to 25 percent

Annual precipitation: 14 to 19 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Clayey-skeletal, mixed Typic
Argiborolls

Typical Pedon

Roy stony loam, in an area of Work-Roy complex, 8 to 25 percent slopes, in rangeland, 2,200 feet west and 100 feet south of the northeast corner of sec. 5, T. 20 N., R. 8 E.

A—0 to 7 inches; dark grayish brown (10YR 4/2) stony loam, very dark brown (10YR 2/2) moist; strong medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and common medium roots; 10 percent stones, 10 percent cobbles, and 5 percent pebbles; neutral; clear smooth boundary.

Bt—7 to 15 inches; dark grayish brown (10YR 4/2) very cobbly clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; very hard, friable, sticky and plastic; many very fine and fine and common medium roots; common very fine tubular pores; common distinct clay films on faces of peds; 2 percent stones, 20 percent cobbles, and 25 percent pebbles; neutral; clear wavy boundary.

BC1—15 to 38 inches; brown (10YR 5/3) very cobbly sandy clay loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many fine and very fine tubular and irregular pores; 25 percent cobbles, 30 percent pebbles; mildly alkaline; gradual wavy boundary.

BC2—38 to 60 inches; brown (10YR 5/3) extremely cobbly sandy clay loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine tubular and irregular pores; 35 percent cobbles, 35 percent pebbles; mildly alkaline.

Range in Characteristics

Mollic epipedon thickness: 10 to 16 inches

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

Rock fragments in the control section: 35 to 80 percent

A horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Texture: loam, clay loam

Clay content: 15 to 40 percent

Rock fragments: 5 to 55 percent—5 to 30 percent stones and cobbles, 0 to 25 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 7.5YR or 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2, 3, or 4

Texture: clay loam, clay

Clay content: 35 to 50 percent

Rock fragments: 35 to 80 percent—20 to 50 percent stones and cobbles, 15 to 30 percent pebbles

Reaction: pH 6.6 to 7.8

BC horizons

Hue: 7.5YR through 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 3, 4, or 5

Texture: clay loam, sandy clay loam

Clay content: 27 to 40 percent

Rock fragments: 35 to 80 percent—20 to 50 percent stones and cobbles, 15 to 30 percent pebbles

Reaction: pH 7.4 to 8.4

71D—Roy very cobbly clay loam, 2 to 15 percent slopes

Setting

Landform: Relict stream terraces

Slope: 2 to 15 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Roy and similar soils: 85 percent

Minor Components

Stony surface layers: 0 to 5 percent
 Slopes less than 2 percent: 0 to 5 percent
 Moderately deep soils: 0 to 2 percent
 Loam or clay loam surfaces: 0 to 2 percent
 Poorly drained soils: 0 to 1 percent

Major Component Description

Surface layer texture: Very cobbly clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Sagedale Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans, stream terraces, small drainageways, hills
Parent material: Alluvium
Slope range: 0 to 45 percent
Annual precipitation: 14 to 17 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Fine, montmorillonitic, frigid Typic Ustochrepts

Typical Pedon

Sagedale silty clay loam, 0 to 4 percent slopes, in rangeland, 1,100 feet west and 300 feet south of the northeast corner of sec. 8, T. 21 N., R. 10 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine subangular blocky structure parting to moderate fine granular; hard, firm, sticky and plastic; common fine and medium roots; mildly alkaline; clear smooth boundary.

Bw—4 to 15 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist;

moderate fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; common fine and very fine roots; common very fine tubular pores; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk—15 to 30 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse subangular blocky structure; very hard, firm, very sticky and very plastic; few fine roots; common very fine tubular pores; few fine seams and masses of lime; slightly effervescent; moderately alkaline; gradual wavy boundary.

BCky—30 to 60 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; massive; very hard, firm, very sticky and very plastic; few very fine tubular pores; few fine seams and masses of lime and gypsum; slightly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 35 to 45 percent
Depth to the Bk horizon: 10 to 15 inches
Depth to the BCky horizon: 17 to 36 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 moist
 Chroma: 2, 3, or 4
 Clay content: 30 to 40 percent
 Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 moist
 Chroma: 2, 3, or 4
 Texture: silty clay loam, silty clay, clay loam
 Clay content: 32 to 45 percent
 Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: silty clay loam, silty clay
 Clay content: 35 to 45 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

BCky horizon

Hue: 10YR, 2.5Y, 5Y, or N
 Value: 4, 5, or 6 dry; 3, 4, or 5 moist
 Chroma: 0, 2, 3, or 4
 Texture: silty clay loam, clay, silty clay, clay loam

Clay content: 35 to 45 percent
 Calcium carbonate equivalent: 5 to 10 percent
 Electrical conductivity: less than 4 mmhos/cm
 Gypsum content: 1 to 7 percent
 Reaction: pH 7.9 to 9.0

323B—Sagedale silty clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 0 to 4 percent
Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Sagedale and similar soils: 85 percent

Minor Components

Sagedale clay or silty clay: 0 to 5 percent
 Macar and similar soils: 0 to 3 percent
 Calcareous surface layers: 0 to 3 percent
 Moderately saline/sodic soils: 0 to 2 percent
 Sandy or gravelly substratums: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

323C—Sagedale silty clay loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 8 percent

Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Sagedale and similar soils: 85 percent

Minor Components

Macar and similar soils: 0 to 5 percent
 Calcareous surface layers: 0 to 5 percent
 Sandy or gravelly substratums: 0 to 3 percent
 Moderately saline/sodic soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

621E—Sagedale-Wayden silty clay loams, 8 to 25 percent slopes

Setting

Landform:
 * Sagedale—Hills
 * Wayden—Hills
Position on landform:
 * Sagedale—Foothills
 * Wayden—Backslopes and shoulders
Slope:
 * Sagedale—8 to 25 percent
 * Wayden—8 to 25 percent
Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Sagedale and similar soils: 50 percent
 Wayden and similar soils: 35 percent

Minor Components

Macar and similar soils: 0 to 5 percent
 Cabba and similar soils: 0 to 4 percent
 Very gravelly soils: 0 to 3 percent
 Areas of rock outcrop: 0 to 2 percent
 Poorly drained soils (slumps): 0 to 1 percent

Major Component Description

Sagedale

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.4 inches

Wayden

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Savage Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Alluvial fans, stream terraces, drainageways
Parent material: Glaciofluvial deposits
Slope range: 0 to 8 percent
Annual precipitation: 14 to 17 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Argiborolls

Typical Pedon

Savage silty clay loam, 0 to 4 percent slopes, in cropland, 1,300 feet south and 1,600 feet east of the northwest corner of sec. 32, T. 23 N., R. 8 E.

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

Bt1—6 to 11 inches; grayish brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse prismatic structure parting to strong fine and medium subangular blocky; hard, friable, sticky and plastic; many very fine and fine roots; common very fine tubular pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—11 to 16 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots; few very fine tubular pores; common distinct clay films on faces of peds; mildly alkaline; gradual wavy boundary.

Bk1—16 to 22 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots; few very fine tubular pores; few fine masses of lime; slightly effervescent; mildly alkaline; gradual wavy boundary.

Bk2—22 to 30 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; many fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

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

Range in Characteristics

Mollic epipedon thickness: 8 to 16 inches and may include all or part of the Bt horizon

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

Depth to water table (moderately wet phase): 48 to 72 inches

Depth to the Bk horizon: 12 to 22 inches

Soil phases: Moderately wet

A horizon

Hue: 7.5YR, 10YR, or 2.5Y

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

Chroma: 2 or 3

Texture: loam, silty clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.1 to 7.8

Bt1 and Bt2 horizons

Hue: 7.5YR, 10YR, or 2.5Y

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

Chroma: 2, 3, or 4

Texture: silty clay loam, silty clay, clay

Clay content: 35 to 50 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.1 to 8.4

A Btk horizon 4 to 18 inches thick is allowed.

Bk and BCK horizons

Hue: 7.5YR through 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: silty clay loam, silty clay, clay

Clay content: 30 to 45 percent

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

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm; moderately wet phase is 4 to 16 mmhos/cm

Reaction: pH 7.4 to 8.4

Some pedons have C and By horizons below a depth of 36 inches.

The Savage soil in map unit 828A is a taxadjunct to the series because it has interfingering of albic materials into the argillic horizon. It classifies as fine, montmorillonitic Boralfic Argiborolls.

828A—Savage loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 2 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Savage and similar soils: 85 percent

Minor Components

Acel and similar soils: 0 to 5 percent

Moderately saline soils: 0 to 5 percent

Moderately well drained soils: 0 to 3 percent

Somewhat poorly drained soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Glaciofluvial deposits

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

82B—Savage silty clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 4 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Savage and similar soils: 85 percent

Minor Components

Farnuf and similar soils: 0 to 3 percent

Savage loam: 0 to 3 percent

Calcareous surface layers: 0 to 3 percent

Saline and sodic soils: 0 to 2 percent

Accl and similar soils: 0 to 2 percent
Slopes of 4 to 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

842A—Savage-Daglum complex, 0 to 2 percent slopes

Setting

Landform:

- * Savage—Alluvial fans, stream terraces, and drainageways
- * Daglum—Alluvial fans, stream terraces, and drainageways

Position on landform:

- * Savage—Microhighs
- * Daglum—Microlows

Slope:

- * Savage—0 to 2 percent
- * Daglum—0 to 2 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Savage and similar soils: 60 percent
Daglum and similar soils: 25 percent

Minor Components

Strongly saline/sodic soils: 0 to 7 percent
Somewhat poorly drained soils: 0 to 5 percent
Poorly drained soils: 0 to 3 percent

Major Component Description

Savage

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Available water capacity: Mainly 8.6 inches

Daglum

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Water table: Apparent
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Scobey Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains, hills
Parent material: Glacial till
Slope range: 0 to 15 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Scobey clay loam, in an area of Scobey-Kevin clay loams, 0 to 4 percent slopes, in cropland, 800 feet east and 250 feet north of the southwest corner of sec. 20, T. 26 N., R. 10 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; common

very fine roots; slightly acid; abrupt smooth boundary.

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

Bk1—15 to 29 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; many very fine roots; common very fine tubular pores; many fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—29 to 43 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; common fine and medium masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BCky—43 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; common very fine tubular pores; few fine masses of lime and gypsum; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches and may include all or part of the Bt horizon

Content of clay in the control section: 35 to 45 percent

Depth to the Bk horizon: 10 to 20 inches

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Texture: clay loam, fine sandy loam

Clay content: 10 to 35 percent

Rock fragments: 0 to 60 percent—0 to 25 percent cobbles and stones, trace to 40 percent pebbles

Reaction: pH 6.1 to 7.8

Pedons with sandy loam surfaces are in areas which have a thin sandy eolian mantle

Bt horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: clay loam, clay

Clay content: 35 to 45 percent

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

Reaction: pH 6.6 to 8.4

Bk1 and Bk2 horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Clay content: 30 to 40 percent

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

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

A Btk horizon is allowed

BCky horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: 30 to 40 percent

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

Calcium carbonate equivalent: 5 to 12 percent

Sodium adsorption ratio: 1 to 8

Gypsum content: 1 to 6 percent

Reaction: pH 7.4 to 9.0

56A—Scobey clay loam, 0 to 2 percent slopes

Setting

Landform: Till plains

Slope: 0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Scobey and similar soils: 90 percent

Minor Components

Kevin and similar soils: 0 to 4 percent

Ethridge and similar soils: 0 to 2 percent

Acel and similar soils: 0 to 2 percent

Nishon and similar soils: 0 to 1 percent
Telstad and similar soils: 0 to 1 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

561B—Scobey-Kevin clay loams, 0 to 4 percent slopes

Setting

Landform:

- * Scobey—Till plains
- * Kevin—Till plains

Position on landform:

- * Scobey—Foothills and toeslopes
- * Kevin—Backslopes and shoulders

Slope:

- * Scobey—0 to 4 percent
- * Kevin—0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Scobey and similar soils: 55 percent
Kevin and similar soils: 30 percent

Minor Components

Hillon and similar soils: 0 to 7 percent
Elloam and similar soils: 0 to 3 percent
Acel and similar soils: 0 to 2 percent
Telstad and similar soils: 0 to 2 percent
Nishon and similar soils: 0 to 1 percent

Major Component Description

Scobey

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

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

561C—Scobey-Kevin clay loams, 4 to 8 percent slopes

Setting

Landform:

- * Scobey—Till plains
- * Kevin—Till plains

Position on landform:

- * Scobey—Foothills and toeslopes
- * Kevin—Backslopes and shoulders

Slope:

- * Scobey—4 to 8 percent
- * Kevin—4 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Scobey and similar soils: 45 percent
Kevin and similar soils: 40 percent

Minor Components

Hillon and similar soils: 0 to 9 percent
 Acel and similar soils: 0 to 2 percent
 Elloam and similar soils: 0 to 2 percent
 Nishon and similar soils: 0 to 1 percent
 Telstad and similar soils: 0 to 1 percent

Major Component Description**Scobey**

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

Kevin

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

562B—Scobey-Linnet complex, 0 to 4 percent slopes**Setting***Landform:*

- * Scobey—Till plains
- * Linnet—Till plains

Position on landform:

- * Scobey—Backslopes and footslopes
- * Linnet—Toeslopes

Slope:

- * Scobey—0 to 4 percent
- * Linnet—0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Scobey and similar soils: 50 percent
 Linnet and similar soils: 35 percent

Minor Components

Acel and similar soils: 0 to 5 percent
 Kevin and similar soils: 0 to 5 percent
 Ethridge and similar soils: 0 to 2 percent
 Nishon and similar soils: 0 to 2 percent
 Hillon and similar soils: 0 to 1 percent

Major Component Description**Scobey**

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

Linnet

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciofluvial deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Shambo Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour)
Landform: Alluvial fans, stream terraces, hills
Parent material: Alluvium
Slope range: 0 to 35 percent
Annual precipitation: 14 to 19 inches

Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 120 days

Taxonomic Class: Fine-loamy, mixed Typic
 Haploborolls

Typical Pedon

Shambo loam, 2 to 8 percent slopes, in hayland, 1,800 feet north and 300 feet east of the southwest corner of sec. 4, T. 21 N., R. 10 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; abrupt smooth boundary.

Bw—6 to 15 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine tubular pores; slightly effervescent; mildly alkaline; clear wavy boundary.

Bk1—15 to 25 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, sticky and plastic; common fine and very fine roots; many very fine tubular pores; common fine seams and masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—25 to 42 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; many very fine tubular pores; common fine seams and masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BCk—42 to 60 inches; light brownish gray (2.5Y 6/2) loam with lenses of clay loam and fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many very fine tubular pores; few fine seams and masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches
Content of clay in the control section: 18 to 35 percent
Depth to the Bk horizon: 14 to 20 inches

A horizon

Hue: 10YR
 Value: 3, 4, or 5 dry; 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 18 to 27 percent
 Reaction: pH 6.6 to 7.8.

Bw horizon

Hue: 10YR or 2.5Y
 Value: 4, 5, or 6 dry; 3 or 4 moist
 Chroma: 2, 3, or 4
 Texture: loam, silt loam, clay loam; typically averages 15 to 45 percent fine sand and coarser
 Clay content: 18 to 35 percent
 Reaction: pH 6.6 to 8.4

Bk and BCk horizons

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, clay loam, silty clay loam, silt loam
 Clay content: 18 to 35 percent
 Calcium carbonate equivalent: 5 to 20 percent
 Reaction: pH 7.4 to 9.0
 Some pedons have a BCk horizon

74C—Shambo loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Shambo and similar soils: 85 percent

Minor Components

Tally and similar soils: 0 to 5 percent
 Savage and similar soils: 0 to 5 percent
 Very gravelly soils: 0 to 3 percent
 Areas that occasionally flood: 0 to 1 percent
 Somewhat poorly drained soils: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

745F—Shambo-Amor-Cabba loams, 15 to 45 percent slopes**Setting***Landform:*

- * Shambo—Hills
- * Amor—Hills
- * Cabba—Hills

Position on landform:

- * Shambo—Foothills
- * Amor—Backslopes
- * Cabba—Shoulders and summits

Slope:

- * Shambo—15 to 35 percent
- * Amor—15 to 45 percent
- * Cabba—15 to 45 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition**Major Components**

Shambo and similar soils: 35 percent
 Amor and similar soils: 30 percent
 Cabba and similar soils: 20 percent

Minor Components

Tally and similar soils: 0 to 5 percent
 Cohagen and similar soils: 0 to 2 percent
 Areas of rock outcrop: 0 to 2 percent
 Whitlash and similar soils: 0 to 2 percent
 Absarokee and similar soils: 0 to 2 percent
 Stony surface layers: 0 to 2 percent

Major Component Description**Shambo**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.9 inches

Amor

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.7 inches

Cabba

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

741B—Shambo-Straw loams, 0 to 4 percent slopes**Setting***Landform:*

- * Shambo—Alluvial fans and stream terraces
- * Straw—Flood plains

Slope:

- * Shambo—0 to 4 percent
- * Straw—0 to 2 percent

Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Shambo and similar soils: 45 percent
 Straw and similar soils: 40 percent

Minor Components

Tally and similar soils: 0 to 5 percent
 Nesda and similar soils: 0 to 2 percent
 Slopes more than 4 percent: 0 to 2 percent
 Sandy or gravelly substratums: 0 to 2 percent
 Somewhat poorly drained soils: 0 to 2 percent
 Poorly drained soils: 0 to 2 percent

Major Component Description

Shambo

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.9 inches

Straw

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Shane Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Sedimentary plains, hills

Parent material: Residuum from shale
Slope range: 2 to 25 percent
Annual precipitation: 17 to 19 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine, montmorillonitic Abruptic Argiborolls

Typical Pedon

Shane clay loam, in an area of Shane-Gerber complex, 2 to 8 percent slopes, in cropland, 500 feet north and 700 feet east of the southwest corner of sec. 18, T. 20 N., R. 8 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; slightly hard, very friable, sticky and plastic; many fine and very fine roots; moderately acid; abrupt smooth boundary.

Bt1—7 to 12 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; strong fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; many fine and very fine roots; few very fine tubular pores; many faint clay films of faces of peds; slightly acid; clear wavy boundary.

Bt2—12 to 18 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; strong fine and medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; common fine and very fine roots; few very fine tubular pores; many faint clay films of faces of peds; mildly alkaline; gradual wavy boundary.

Bk—18 to 36 inches; grayish brown and yellowish brown (10YR 5/2 and 5/4) clay loam, dark gray to dark yellowish brown (10YR 4/1 to 4/6) moist; moderate thick platy structure; very hard, friable, sticky and plastic; few fine and very fine roots; common very fine tubular pores; many fine seams and masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—36 to 60 inches; gray and yellowish brown (10YR 5/1 and 5/4) shale with thin lenses of sandstone, dark grayish brown and dark yellowish brown (10YR 4/2 and 4/4) moist; common fine and medium masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches (may include the Bt1 horizon)

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

Depth to the Bk horizon: 13 to 26 inches

Depth to the Cr horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 3 moist

Clay content: 27 to 35 percent

Reaction: pH 5.6 to 7.3

Bt1 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: clay, silty clay

Clay content: 45 to 60 percent

Reaction: pH 6.1 to 7.3

Bt2 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: clay, silty clay

Clay content: 45 to 60 percent

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR, 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 0 to 6

Texture: clay loam, clay, silty clay

Clay content: 35 to 55 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

210E—Shane-Barkof-Gerber complex, 8 to 25 percent slopes

Setting

Landform:

* Shane—Hills

* Barkof—Hills

* Gerber—Hills

Position on landform:

* Shane—Backslopes and footslopes

* Barkof—Backslopes and shoulders

* Gerber—Footslopes

Slope:

* Shane—8 to 25 percent

* Barkof—8 to 25 percent

* Gerber—8 to 15 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Shane and similar soils: 40 percent

Barkof and similar soils: 25 percent

Gerber and similar soils: 25 percent

Minor Components

Norbert and similar soils: 0 to 5 percent

Loam surface layers: 0 to 5 percent

Major Component Description

Shane

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.9 inches

Barkof

Surface layer texture: Clay

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Gerber

Surface layer texture: Clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

210C—Shane-Gerber complex, 2 to 8 percent slopes

Setting

Landform: (fig. 5)

- * Shane—Sedimentary plains
- * Gerber—Sedimentary plains

Slope:

- * Shane—2 to 8 percent
- * Gerber—2 to 8 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Shane and similar soils: 60 percent
Gerber and similar soils: 30 percent

Minor Components

Barkof and similar soils: 0 to 3 percent
Acel and similar soils: 0 to 3 percent
Norbert and similar soils: 0 to 2 percent
Loamy surface layers: 0 to 2 percent

Major Component Description

Shane

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)



Figure 5. Typical area of Shane-Gerber complex, 2 to 8 percent slopes in the foreground. The mountains in the background are typical of Libeg-Arrowpeak-Elkner complex, 25 to 70 percent slopes.

Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.9 inches

Gerber

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Straw Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderate (0.6 to 2.0 inches/hour) to 42 inches, below this depth moderately rapid (2.0 to 6.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Annual precipitation: 14 to 19 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 90 to 120 days

Taxonomic Class: Fine-loamy, mixed Cumulic Haploborolls

Typical Pedon

Straw loam, in an area of Shambo-Straw loams, 0 to 4 percent slopes, in rangeland, 2,200 feet north and 350 feet west of the southeast corner of sec. 33, T. 28 N., R. 14 E.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine and medium roots; neutral; clear wavy boundary.

A2—8 to 20 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, fine and medium roots; many very fine tubular pores; mildly alkaline; clear wavy boundary.

Bk1—20 to 30 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine tubular pores; few fine threads and masses of lime; slightly effervescent; mildly alkaline; clear wavy boundary.

Bk2—30 to 42 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine tubular pores; few fine masses of lime; slightly effervescent; mildly alkaline; abrupt wavy boundary.

2C—42 to 60 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; mildly alkaline.

Range in Characteristics

Mollic epipedon thickness: 16 to 40 inches
Content of clay in the control section: 20 to 35 percent
Depth to the 2C horizon: 40 to 60 inches
Soil phases: Rarely flooded, occasionally flooded

A horizons

Hue: 10YR or 2.5Y
 Value: 3 or 4 dry, 2 or 3 moist
 Chroma: 2 or 3
 Clay content: 10 to 27 percent with less than 15 to 35 percent fine and coarser sand
 Rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 0 to 5 percent
 Reaction: pH 6.6 to 8.4

Bk horizons

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, silty clay loam, clay loam
 Clay content: 18 to 35 percent with less than 15 to 35 percent fine and coarser sand

Rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 3 to 15 percent
 Reaction: pH 6.6 to 8.4

2C horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Texture: stratified clay loam to loamy sand but mainly sandy loam or loamy sand
 Clay content: 5 to 35 percent
 Rock fragments: 0 to 10 percent pebbles
 Calcium carbonate equivalent: 2 to 12 percent
 Reaction: pH 7.4 to 8.4

Sunburst Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills, escarpments
Parent material: Glacial till
Slope range: 8 to 70 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

Typical Pedon

Sunburst clay loam, in an area of Sunburst-Lambeth complex, 25 to 70 percent slopes, in rangeland, 800 feet west and 1,000 feet south of the northeast corner of sec. 17, T. 21 N., R. 6 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; slightly hard, firm, very sticky and very plastic; many fine roots; strongly effervescent; mildly alkaline; clear wavy boundary.

Bk1—4 to 9 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; common very fine and fine roots; many very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—9 to 25 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; few very fine roots; many very fine tubular pores; common fine and medium masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bky—25 to 60 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure, hard, firm, very sticky and very plastic; common very fine tubular pores; common fine and medium masses of lime; few fine masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

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

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 35 to 40 percent
 Rock fragments: 2 to 60 percent—2 to 50 percent pebbles, 0 to 10 percent cobbles
 Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 2.5Y or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Texture: clay, clay loam, silty clay loam
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 8.4

Bky horizon

Hue: 2.5Y or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Texture: clay, clay loam, silty clay
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Gypsum content: 1 to 3 percent
 Reaction: pH 7.4 to 9.0

92E—Sunburst-Bascovy complex, 8 to 25 percent slopes

Setting

Landform:

- * Sunburst—Hills
- * Bascovy—Hills

Position on landform:

- * Sunburst—Backslopes and shoulders
- * Bascovy—Foothills

Slope:

- * Sunburst—8 to 25 percent
- * Bascovy—8 to 25 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Sunburst and similar soils: 45 percent
Bascovy and similar soils: 40 percent

Minor Components

Neldore and similar soils: 0 to 10 percent
Saline and sodic soils: 0 to 5 percent

Major Component Description

Sunburst

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.2 inches

Bascovy

Surface layer texture: Silty clay

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Shale residuum

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 4.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

925F—Sunburst-Lambeth complex, 25 to 70 percent slopes

Setting

Landform:

- * Sunburst—Escarpments
- * Lambeth—Escarpments

Position on landform:

- * Sunburst—Backslopes and foothills
- * Lambeth—Backslopes and shoulders

Slope:

- * Sunburst—25 to 70 percent
- * Lambeth—25 to 70 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Sunburst and similar soils: 45 percent
Lambeth and similar soils: 40 percent

Minor Components

Cabbart and similar soils: 0 to 6 percent
Bascovy and similar soils: 0 to 5 percent
Tinsley and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Sunburst

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 8.2 inches

Lambeth

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Glaciolacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Sweetgrass Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour) and moderate (0.6 to 2.0 inch/hour) to 25 inches, below this depth rapid (6.0 to 20.0 inches/hour)
Landform: Relict stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Annual precipitation: 14 to 17 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Clayey over sandy or sandy-skeletal, montmorillonitic Typic Argiborolls

Typical Pedon

Sweetgrass clay loam, in an area of Sweetgrass-Beaverton complex, 0 to 2 percent slopes, in cropland, 800 feet east and 600 feet north of the southwest corner of sec. 17, T. 26 N., R. 16 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; slightly hard, very friable, sticky and plastic; many fine and very fine roots; 5 percent pebbles; neutral; abrupt smooth boundary.

Bt1—6 to 13 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very hard, friable, sticky and plastic; many fine and very fine roots; common very fine tubular pores; many distinct clay films on faces of peds; 5 percent pebbles; neutral; clear wavy boundary.

Bt2—13 to 18 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong fine and medium angular blocky; very hard, friable, sticky and plastic; common fine and very fine roots; common very fine tubular pores; many faint clay films on faces of peds; 10 percent pebbles, few cobbles; mildly alkaline; clear wavy boundary.

2Bk—18 to 25 inches; grayish brown (10YR 5/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common fine and very fine roots; many very fine tubular and irregular pores; 20 percent pebbles, 10 percent cobbles; lime disseminated; violently effervescent; mildly alkaline; gradual wavy boundary.

3BCk—25 to 46 inches; grayish brown (10YR 5/2) very gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; many fine and very fine irregular pores; 35 percent pebbles, 15 percent cobbles; lime disseminated and as coats on lower surfaces of rock fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

3C—46 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; many fine and very fine irregular pores; 50 percent pebbles, 15 percent cobbles; lime disseminated; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches (may include Bt1 horizon)

Depth to the 2Bk horizon: 12 to 20 inches

Depth to the 3BCk horizon: 20 to 40 inches

A horizon

Hue: 10YR or 7.5YR

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Rock fragments: 0 to 25 percent—0 to 5 percent

cobbles, 0 to 25 percent pebbles

Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 10YR or 7.5YR

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

Chroma: 2, 3, or 4

Texture: clay loam, clay

Clay content: 35 to 50 percent
 Rock fragments: 0 to 25 percent—0 to 5 percent
 cobbles, 0 to 25 percent pebbles
 Reaction: pH 6.6 to 7.8

2Bk 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: clay loam, sandy clay loam, loam, sandy
 loam
 Clay content: 10 to 30 percent
 Rock fragments: 5 to 35 percent—0 to 10 percent
 cobbles, 5 to 35 percent pebbles
 Calcium carbonate equivalent: 15 to 50 percent
 Reaction: pH 7.4 to 8.4

3BCK horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loamy sand, loamy coarse sand, coarse
 sand, sand
 Clay content: 0 to 15 percent
 Rock fragments: 35 to 80 percent—0 to 15 percent
 stones, 5 to 25 percent cobbles, 30 to 50 percent
 pebbles
 Calcium carbonate equivalent: 10 to 20 percent
 Reaction: pH 7.4 to 8.4

3C horizon

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loamy sand, loamy coarse sand, coarse
 sand, sand
 Clay content: 1 to 10 percent
 Rock fragments: 35 to 80 percent—0 to 15
 percent stones, 5 to 25 percent cobbles, 30
 to 50 percent pebbles
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 8.4

531A—Sweetgrass-Beaverton complex, 0 to 2 percent slopes

Setting

Landform:

- * Sweetgrass—Relict stream terraces
- * Beaverton—Relict stream terraces

Position on landform:

- * Sweetgrass—Treads
- * Beaverton—Treads

Slope:

- * Sweetgrass—0 to 2 percent
- * Beaverton—0 to 2 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Sweetgrass and similar soils: 60 percent
 Beaverton and similar soils: 30 percent

Minor Components

Turner and similar soils: 0 to 5 percent
 Martinsdale and similar soils: 0 to 5 percent

Major Component Description

Sweetgrass

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

Beaverton

Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

531C—Sweetgrass-Beaverton complex, 2 to 8 percent slopes

Setting

Landform:

- * Sweetgrass—Relict stream terraces
- * Beaverton—Relict stream terraces
- * Beaverton—Relict stream terraces

Position on landform:

- * Sweetgrass—Treads
- * Beaverton—Treads
- * Beaverton—Treads

Slope:

- * Sweetgrass—2 to 4 percent
- * Beaverton—2 to 8 percent
- * Beaverton—2 to 8 percent

Mean annual precipitation: 14 to 17 inches*Frost-free period:* 100 to 120 days**Composition****Major Components**

Sweetgrass and similar soils: 50 percent
 Beaverton and similar soils: 20 percent
 Beaverton and similar soils: 20 percent

Minor Components

Martinsdale and similar soils: 0 to 5 percent
 Stony surface layers: 0 to 5 percent

Major Component Description**Sweetgrass**

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

Beaverton

Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

Beaverton

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Tally Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Alluvial fans, stream terraces, small drainageways, hills
Parent material: Alluvium
Slope range: 2 to 45 percent
Annual precipitation: 14 to 17 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Coarse-loamy, mixed Typic Haploborolls

Typical Pedon

Tally fine sandy loam, in an area of Tally-Vebar fine sandy loams, 8 to 25 percent slopes, in rangeland, 2,800 feet south and 1,500 feet east of the northwest corner of sec. 36, T. 21 N., R. 12 E.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots and few medium roots; neutral; clear smooth boundary.

Bw1—5 to 13 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure; hard, very friable, nonsticky and nonplastic; common fine and very fine roots; many very fine and few fine tubular pores; neutral; clear wavy boundary.

Bw2—13 to 24 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, nonsticky and nonplastic; common fine and very fine roots; many very fine and few fine tubular pores; neutral; clear wavy boundary.

Bk—24 to 35 inches; grayish brown (10YR 5/2) fine sandy loam dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; many very fine tubular pores; few fine masses of lime; slightly effervescent; moderately alkaline; clear wavy boundary.

BCK—35 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive, slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; many very fine tubular pores; common fine seams and masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 10 to 16 inches
Content of clay in the control section: 5 to 18 percent
Depth to the Bk horizon: 15 to 30 inches

A horizon

Hue: 2.5Y, 10YR, or 7.5YR
 Value: 3, 4, or 5 dry; 2, 3, or 4 moist
 Chroma: 2 or 3
 Clay content: 10 to 20 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.1 to 7.8

Bw1 horizon

Hue: 7.5YR, 10YR, or 2.5Y
 Value: 4 or 5 dry, 2 or 3 moist
 Chroma: 2 or 3
 Texture: fine sandy loam, sandy loam
 Clay content: 5 to 18 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 7.8

Bw2 horizon

Hue: 7.5YR, 10YR, or 2.5Y
 Value: 4 or 5 dry, 3 or 4 moist
 Chroma: 2 or 3
 Texture: fine sandy loam, sandy loam
 Clay content: 5 to 18 percent
 Rock fragments: 0 to 15 percent pebbles
 Reaction: pH 6.6 to 7.8

Bk and BCK horizons

Hue: 10YR, 2.5Y, 7.5YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4

Texture: loamy fine sand, loamy sand, fine sand, fine sandy loam, sandy loam
 Clay content: 5 to 18 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Rock fragments: 0 to 15 percent pebbles above 40 inches, 0 to 25 percent below 40 inches
 Reaction: pH 7.4 to 8.4
 The loamy fine sand, loamy sand, and fine sand occur at a depth of more than 20 inches; some pedons have glacial till at depths of 40 to 60 inches

943C—Tally fine sandy loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways
Slope: 2 to 8 percent
Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Tally and similar soils: 85 percent

Minor Components

Shambo and similar soils: 0 to 5 percent
 Very deep, sandy soils: 0 to 5 percent
 Slopes less than 2 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

943F—Tally-Cohagen fine sandy loams, 25 to 60 percent slopes

Setting

Landform:

- * Tally—Hills
- * Cohagen—Hills

Position on landform:

- * Tally—Backslopes and footslopes
- * Cohagen—Backslopes and shoulders

Slope:

- * Tally—25 to 45 percent
- * Cohagen—25 to 60 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Tally and similar soils: 45 percent
Cohagen and similar soils: 40 percent

Minor Components

Vebar and similar soils: 0 to 4 percent
Areas of rock outcrop: 0 to 3 percent
Amor and similar soils: 0 to 3 percent
Cabba and similar soils: 0 to 2 percent
Whitlash and similar soils: 0 to 2 percent
Tinsley and similar soils: 0 to 1 percent

Major Component Description

Tally

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.7 inches

Cohagen

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

943E—Tally-Vebar fine sandy loams, 8 to 25 percent slopes

Setting

Landform:

- * Tally—Hills
- * Vebar—Hills

Position on landform:

- * Tally—Footslopes
- * Vebar—Backslopes and shoulders

Slope:

- * Tally—8 to 25 percent
- * Vebar—8 to 25 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Tally and similar soils: 50 percent
Vebar and similar soils: 35 percent

Minor Components

Cohagen and similar soils: 0 to 5 percent
Cabba and similar soils: 0 to 3 percent
Slopes more than 25 percent: 0 to 3 percent
Macar and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Tally

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.7 inches

Vebar

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Tamaneen Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderately slow (0.2 to 0.6 inch/hour) to 19 inches, moderate (0.6 to 2.0 inches/hour) from 19 to 29 inches, below this depth moderately rapid (2.0 to 6.0 inches/hour)

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Annual precipitation: 15 to 19 inches

Annual air temperature: 41 to 45 degrees F

Frost-free period: 90 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Argiborolls

Typical Pedon

Tamaneen clay loam, 0 to 4 percent slopes, in rangeland, 1,800 feet north and 150 feet east of the southwest corner of sec. 6, T. 20 N., R. 12 E.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, friable, slightly sticky and slightly plastic; many fine and coarse roots and common very fine roots; neutral; clear smooth boundary.

A2—2 to 5 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and coarse roots and common very fine roots; many very fine pores; neutral; clear smooth boundary.

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

Bt2—9 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common fine and very fine roots; common very fine tubular pores; common faint clay films on faces of peds; neutral; clear wavy boundary.

Bk—14 to 19 inches; white (10YR 8/2) clay loam, light brownish gray (10YR 6/2) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; common very fine tubular pores; many fine masses of lime and disseminated lime; violently effervescent; mildly alkaline; clear wavy boundary.

BCk—19 to 29 inches; white (10YR 8/2) gravelly clay loam, light brownish gray (10YR 6/2) moist; massive; slightly hard; very friable, slightly sticky and slightly plastic; 20 percent pebbles; disseminated lime; violently effervescent; moderately alkaline; clear wavy boundary.

2BCk—29 to 60 inches; white (10YR 8/2) extremely gravelly sandy loam, light brownish gray (10YR 6/2) moist; massive; soft, very friable, nonsticky and nonplastic; 50 percent pebbles, 20 percent cobbles; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 8 to 15 inches

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

Depth to the calcic horizon: 11 to 15 inches

Soil phases: Cobbly

A horizons

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent mixed

Rock fragments: 0 to 10 percent—0 to trace cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 10YR or 2.5Y
 Value: 4 or 5 dry, 3 or 4 moist
 Chroma: 2 or 3
 Texture: silty clay, silty clay loam, clay loam
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 10 percent—0 to trace
 cobbles, 0 to 10 percent pebbles
 Reaction: pH 6.6 to 7.8

Bk and BCk horizons

Hue: 10YR or 2.5Y
 Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Texture: clay loam, silty clay, silty clay loam
 Clay content: 18 to 35 percent
 Rock fragments: 5 to 20 percent—0 to trace
 cobbles, 5 to 20 percent pebbles
 Calcium carbonate equivalent: 20 to 30 percent
 Reaction: pH 7.4 to 8.4

2BCk horizon

Hue: 10YR or 2.5Y
 Value: 6, 7, or 8 dry; 5, 6, or 7 moist
 Chroma: 2, 3, or 4
 Texture: clay loam or loam
 Clay content: 8 to 25 percent
 Rock fragments: 30 to 45 percent—0 to 10 percent
 cobbles, 30 to 35 percent pebbles
 Calcium carbonate equivalent: 25 to 40 percent
 Reaction: pH 7.9 to 8.4

87B—Tamaneen clay loam, 0 to 4 percent slopes**Setting**

Landform: Relict stream terraces (fig. 6)
Position on landform: Treads
Slope: 0 to 4 percent



Figure 6. Typical area of 87B Tamaneen clay loam, 0 to 4 percent slopes on a relict stream terrace in the foreground. Map units 510 Rock outcrop-Belain complex, 15 to 45 percent slopes and 560F Elve-Rock outcrop complex, 25 to 70 percent slopes are in the background. Square Butte provides excellent habitat for mountain goats and other wildlife.

Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components

Tamaneen and similar soils: 85 percent

Minor Components

Sweetgrass and similar soils: 0 to 5 percent
 Work and similar soils: 0 to 5 percent
 Roy and similar soils: 0 to 3 percent
 Very cobbly surface layers: 0 to 1 percent
 Stony surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

871B—Tamaneen cobbly clay loam, 0 to 4 percent slopes

Setting

Landform: Relict stream terraces
Position on landform: Treads
Slope: 0 to 4 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components

Tamaneen and similar soils: 85 percent

Minor Components

Sweetgrass and similar soils: 0 to 5 percent
 Calcareous surface layers: 0 to 5 percent
 Very cobbly surface layers: 0 to 2 percent
 Very stony surface layers: 0 to 1 percent
 Roy and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Cobbly clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

871C—Tamaneen cobbly clay loam, 4 to 8 percent slopes

Setting

Landform: Relict stream terraces
Position on landform: Treads
Slope: 4 to 8 percent
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components

Tamaneen and similar soils: 85 percent

Minor Components

Sweetgrass and similar soils: 0 to 3 percent
 Calcareous surface layers: 0 to 3 percent
 Very cobbly surface layers: 0 to 3 percent
 Work and similar soils: 0 to 2 percent
 Roy and similar soils: 0 to 2 percent
 Slopes more than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Cobbly clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Tanna Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Till plains

Parent material: Residuum from shale

Slope range: 2 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Aridic Argiborolls

Typical Pedon

Tanna clay loam, 2 to 8 percent slopes, in cropland, 300 feet south and 1,350 feet east of the northwest corner of sec. 36, T. 23 N., R. 4 E.

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

Bt1—6 to 9 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, sticky and plastic; many fine and very fine roots; many very fine tubular pores; common distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—9 to 14 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, sticky and plastic; many fine and very fine roots; many very fine tubular pores; many distinct clay films on faces of peds; neutral; clear wavy boundary.

Bk—14 to 21 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine tubular pores; few thin clay films; common fine

masses of lime; strongly effervescent; mildly alkaline; gradual wavy boundary.

2Bk—21 to 28 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate thick platy structure; hard, friable, sticky and plastic; common fine and very fine roots; few very fine pores; 25 percent small shale fragments; few fine masses of lime; slightly effervescent; mildly alkaline; gradual wavy boundary.

2Cr—28 to 60 inches; gray (10YR 5/1) shale, dark gray (10YR 4/1) moist; slightly effervescent; neutral.

Range in Characteristics

Mollic epipedon thickness: 7 to 12 inches

Content of clay in the control section: 35 to 45 percent

Depth to the Bk horizon: 11 to 16 inches

Depth to the Cr horizon: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Rock fragments: 0 to 10 percent—0 to 5 percent cobbles, 0 to 5 percent channers

Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 10YR or 2.5Y

Value: 3 or 4 moist

Chroma: 2 or 3

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

Clay content: 35 to 50 percent

Rock fragments: 0 to 10 percent—0 to 5 percent cobbles, 0 to 5 percent channers

Electrical conductivity: less than 4 mmhos/cm

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: clay loam, silty clay loam, or clay

Clay content: 35 to 50 percent

Rock fragments: 0 to 10 percent—0 to 5 percent cobbles, 0 to 5 percent channers

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

2Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1, 2, 3, or 4
 Texture: loam, clay loam, clay, or silty clay loam
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 60 percent—0 to 5 percent cobbles, 10 to 55 percent channers
 Electrical conductivity: 2 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4
 Some pedons have a Bky horizon with few to common threads of gypsum

2Cr horizon

Material: semiconsolidated shale

13C—Tanna clay loam, 2 to 8 percent slopes

Composition

Major Components

Tanna and similar soils: 85 percent

Minor Components

Scobey and similar soils: 0 to 5 percent
 Yawdim and similar soils: 0 to 5 percent
 Hillon and similar soils: 0 to 3 percent
 Slopes more than 8 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Telstad Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Till plains
Parent material: Glacial till

Slope range: 0 to 8 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Telstad loam, in an area of Telstad-Joplin loams, 0 to 4 percent slopes, in rangeland, 500 feet west and 50 feet south of the northeast corner of sec. 36, T. 26 N., R. 7 E.

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

Bt1—5 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; many fine and very fine roots; common very fine tubular pores; common faint clay films of faces of peds; neutral; clear wavy boundary.

Bt2—9 to 14 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; many very fine and common fine roots; common very fine tubular pores; few faint clay films on faces of peds; neutral; clear wavy boundary.

Bk—14 to 23 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak fine and medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine tubular pores; common fine and medium masses and seams of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bck—23 to 38 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, sticky and slightly plastic; few very fine and fine roots; many very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—38 to 60 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine tubular pores; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 12 inches

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

Depth to the Bk horizon: 10 to 16 inches

A horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Clay content: 18 to 27 percent

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

Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: loam or clay loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: loam or clay loam

Clay content: 20 to 32

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

BCK horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 20 to 32 percent

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Calcium carbonate equivalent: 3 to 12 percent

Electrical conductivity: 2 to 4 mmhos/cm

Bulk density air dry: 1.7 or more

Reaction: pH 7.9 to 8.4

BC horizon

Hue: 10YR, 2.5Y, or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 20 to 32 percent

Rock fragments: 0 to 10 percent—0 to 2 percent cobbles, 0 to 8 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Gypsum content: 0 to 3 percent

Bulk density, air dry: 1.7 or more

Reaction: pH 7.9 to 9.0

50A—Telstad loam, 0 to 2 percent slopes

Setting

Landform: Till plains

Slope: 0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Telstad and similar soils: 90 percent

Minor Components

Joplin and similar soils: 0 to 6 percent

Fortbenton and similar soils: 0 to 3 percent

Nishon and similar soils: 0 to 1 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

503B—Telstad-Joplin loams, 0 to 4 percent slopes**Setting***Landform:*

- * Telstad—Till plains
- * Joplin—Till plains

Position on landform:

- * Telstad—Foothills and toeslopes
- * Joplin—Backslopes and shoulders

Slope:

- * Telstad—0 to 4 percent
- * Joplin—0 to 4 percent

Mean annual precipitation: 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Telstad and similar soils: 55 percent
Joplin and similar soils: 30 percent

Minor Components

Fortbenton and similar soils: 0 to 6 percent
Hillon and similar soils: 0 to 4 percent
Scobey and similar soils: 0 to 2 percent
Elloam and similar soils: 0 to 2 percent
Nishon and similar soils: 0 to 1 percent

Major Component Description**Telstad***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.8 inches**Joplin***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.4 inches**Management**

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

503C—Telstad-Joplin loams, 4 to 8 percent slopes**Setting***Landform:*

- * Telstad—Till plains
- * Joplin—Till plains

Position on landform:

- * Telstad—Foothills and toeslopes
- * Joplin—Backslopes and shoulders

Slope:

- * Telstad—4 to 8 percent
- * Joplin—4 to 8 percent

Mean annual precipitation: 11 to 14 inches*Frost-free period:* 105 to 125 days**Composition****Major Components**

Telstad and similar soils: 45 percent
Joplin and similar soils: 40 percent

Minor Components

Hillon and similar soils: 0 to 6 percent
Fortbenton and similar soils: 0 to 3 percent
Scobey and similar soils: 0 to 2 percent
Marmarth and similar soils: 0 to 2 percent
Nishon and similar soils: 0 to 1 percent
Elloam and similar soils: 0 to 1 percent

Major Component Description**Telstad***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.8 inches

Joplin

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Thoeny Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Till plains

Parent material: Glacial till

Slope range: 0 to 4 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Thoeny loam, in an area of Thoeny-Elloam-Absher complex, 0 to 4 percent slopes, in rangeland, 1,700 feet south and 2,400 feet east of the northwest corner of sec. 26, T. 25 N., R. 14 E.

A—0 to 3 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; neutral; clear smooth boundary.

E—3 to 6 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine tubular pores; neutral; abrupt smooth boundary.

Bt—6 to 14 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; strong coarse columnar structure; very hard, firm, sticky and plastic; common fine and very fine roots; common

very fine tubular pores; many distinct clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bkn1—14 to 24 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, sticky and plastic; common fine and very fine roots; common very fine tubular pores; few fine and medium masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bkn2—24 to 34 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; very hard, friable, sticky and plastic; few fine and very fine roots; few very fine tubular pores; common fine masses of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bkny—34 to 60 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine tubular pores; few fine masses of lime; common fine and few medium masses of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

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

Depth to the Bkn horizon: 12 to 16 inches

Depth to the Bkny horizon: 24 to 36 inches

A and E horizons

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

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

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 5.6 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: clay, clay loam

Clay content: 35 to 50 percent

Sodium adsorption ratio: 5 to 20

Electrical conductivity: 4 to 8 mmhos/cm

Skeletons: unstained sand and silt grains range from very few to common faint on vertical faces of peds

Rock fragments: 0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles
 Structure: strong to medium, columnar prismatic, or blocky
 Reaction: pH 7.4 to 9.0

Bkn horizons

Hue: 10YR or 2.5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Texture: clay, clay loam
 Clay content: 35 to 50 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles
 Electrical conductivity: 4 to 8 mmhos/cm
 Sodium adsorption ratio: 13 to 25 or more exchangeable magnesium plus sodium than calcium plus exchange acidity
 Calcium carbonate equivalent: 5 to 10 percent
 Reaction: pH 7.4 to 9.0

Bkny horizon

Hue: 2.5Y or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2 or 3
 Clay content: 35 to 40 percent
 Bulk density, air dry: 1.55 gr/ccm and greater
 Rock fragments: 0 to 15 percent—0 to 5 percent cobbles and stones, 0 to 10 percent pebbles
 Electrical conductivity: 4 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 25 or more exchangeable magnesium plus sodium than calcium plus exchange acidity
 Gypsum content: 1 to 3 percent
 Reaction: pH 7.9 to 9.0

521B—Thoeny-Elloam-Absher complex, 0 to 4 percent slopes

Setting

Landform:

- * Thoeny—Till plains
- * Elloam—Till plains
- * Absher—Till plains

Position on landform:

- * Thoeny—Microhighs
- * Elloam—Microlows
- * Absher—Microlows

Slope:

- * Thoeny—0 to 4 percent
- * Elloam—0 to 4 percent
- * Absher—0 to 4 percent

Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Thoeny and similar soils: 35 percent
 Elloam and similar soils: 30 percent
 Absher and similar soils: 25 percent

Minor Components

Phillips and similar soils: 0 to 5 percent
 Hillon and similar soils: 0 to 3 percent
 Weingart and similar soils: 0 to 1 percent
 Tanna and similar soils: 0 to 1 percent

Major Component Description

Thoeny

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 7.6 inches

Elloam

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

Absher

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Tinsley Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Excessively drained

Permeability: Rapid (6.0 to 20.0 inches/hour)

Landform: Relict stream terraces

Parent material: Glacial outwash

Slope range: 2 to 45 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Typic Ustorthents

Typical Pedon

Tinsley gravelly sandy loam, in an area of Attewan-Tinsley complex, 2 to 8 percent slopes, in rangeland, 2,100 feet west and 1,200 feet south of the northeast corner of sec. 6, T. 23 N., R. 8 E.

A—0 to 6 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; very soft, very friable, nonsticky and nonplastic; many fine roots; 5 percent cobbles, 15 percent pebbles; strongly effervescent; mildly alkaline; clear smooth boundary.

C—6 to 60 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; 45 percent pebbles; 10 percent cobbles; slightly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 0 to 10 percent

Rock fragments in the control section: 35 to 70 percent

A horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2, 3, or 4

Clay content: 5 to 10 percent

Rock fragments: 15 to 60 percent—0 to 10 percent stones and cobbles, 15 to 50 percent pebbles

Reaction: pH 6.6 to 7.8

C horizon

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: sand or loamy sand

Clay content: 0 to 10 percent

Rock fragments: 35 to 70 percent—5 to 25 percent stones and cobbles, 30 to 45 percent pebbles

Reaction: pH 7.4 to 8.4.

77F—Tinsley gravelly sandy loam, 15 to 45 percent slopes

Setting

Landform: Relict stream terraces

Slope: 15 to 45 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Tinsley and similar soils: 85 percent

Minor Components

Busby and similar soils: 0 to 5 percent

Yetull and similar soils: 0 to 5 percent

Slopes more than 45 percent: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Glacial outwash

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Toston Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat poorly drained

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

and slow (0.06 to 0.2 inch/hour) to 16 inches,

below this depth moderate (0.6 to 2.0 inches/hour)

Landform: Flood plains

Parent material: Alluvium

Slope range: 0 to 1 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine-loamy, mixed Typic
Natriboralfs

Typical Pedon

Toston clay loam, 0 to 1 percent slopes, in rangeland, 1,250 feet north and 1,900 feet east of the southwest corner of sec. 32, T. 29 N., R. 13 E.

E—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; strong medium granular structure; hard, very friable, sticky and plastic; common very fine and fine roots; mildly 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 medium columnar structure parting to strong fine subangular blocky; very hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores; common distinct clay films on faces of peds; moderately alkaline; clear smooth boundary.

Bknyz1—9 to 16 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine, few fine tubular pores; few fine threads and masses of lime, gypsum and other salts; strongly effervescent; strongly alkaline; clear wavy boundary.

Bknyz2—16 to 32 inches; light brownish gray (2.5Y 6/2) silt loam with thin lenses of loam and fine sandy loam, grayish brown (2.5Y 5/2) moist; few fine and medium light yellowish brown and yellowish brown (10YR 6/4 and 5/4) mottles; massive; hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine tubular pores; few fine threads and masses of lime; common fine seams of gypsum and other salts; strongly effervescent; strongly alkaline; gradual wavy boundary.

Bnyz—32 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam with thin lenses of loam and fine sandy loam, grayish brown (2.5Y 5/2) moist; common fine and medium distinct light yellowish brown and brownish yellow (10YR 6/4 and 6/6) mottles; massive; very hard, friable, sticky and plastic; many very fine tubular pores; many fine

seams of gypsum and other salts; lime disseminated; strongly effervescent; strongly alkaline.

Range in Characteristics

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

Depth to water table: 36 to 60 inches

Depth to the Bknyz horizon: 6 to 20 inches

E horizon

Hue: 10YR or 2.5Y

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

Chroma: 1, 2, or 3

Clay content: 18 to 35 percent

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 7.9 to 9.0

Btn horizon

Hue: 10YR or 2.5Y

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

Chroma: 1, 2, or 3

Texture: silty clay, silty clay loam

Clay content: 35 to 45 percent with 15 to 35 percent sand coarser than very fine sand

Sodium adsorption ratio: 13 to 30

Electrical conductivity: 4 to 16 mmhos/cm

Gypsum content: 1 to 3 percent

Reaction: pH 7.9 to 9.0

Bknyz horizons

Hue: 10YR or 2.5Y

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

Chroma: 1, 2, or 3

Clay content: 27 to 35 percent with 15 to 35 percent sand coarser than very fine sand

Calcium carbonate equivalent: 5 to 15 percent

Sodium adsorption ratio: 13 to 30

Electrical conductivity: 8 to 16 mmhos/cm

Gypsum content: 1 to 5 percent

Reaction: pH 8.5 to 9.0

Bnyz horizon

Hue: 10YR or 2.5Y

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

Chroma: 1, 2, or 3

Texture: silt loam or silty clay loam stratified with silty clay, loam, loamy fine sand, or loamy sand

Clay content: 10 to 30 percent with 15 to 35 percent sand coarser than very fine sand

Mottles: faint to prominent and common to many

Rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 2 to 15 percent

Electrical conductivity: 8 to 16 mmhos/cm

Reaction: pH 7.9 to 9.0

263A—Toston clay loam, 0 to 1 percent slopes

Setting

Landform: Flood plains

Slope: 0 to 1 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Toston and similar soils: 85 percent

Minor Components

Nobe and similar soils: 0 to 5 percent

Havre and similar soils: 0 to 5 percent

Poorly drained soils: 0 to 3 percent

Areas that occasionally flood: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 7.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

264A—Toston-Nobe complex, 0 to 1 percent slopes

Setting

Landform:

* Toston—Flood plains

* Nobe—Flood plains

Position on landform:

* Toston—Microlows

* Nobe—Microhighs

Slope:

* Toston—0 to 1 percent

* Nobe—0 to 1 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Toston and similar soils: 55 percent

Nobe and similar soils: 30 percent

Minor Components

Stratified sand to clay soils: 0 to 10 percent

Poorly drained soils: 0 to 3 percent

Areas that occasionally flood: 0 to 2 percent

Major Component Description

Toston

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 7.5 inches

Nobe

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Rare

Water table: Apparent

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 4.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Turner Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour) to 34 inches, below this depth rapid (6.0 to 20.0 inches/hour)

Landform: Relict stream terraces

Parent material: Alluvium

Slope range: 0 to 4 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

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

Typical Pedon

Turner loam, in an area of Turner-Beaverton complex, 2 to 8 percent slopes, in pasture, 1,200 feet north and 2,100 feet west of the southeast corner of sec. 23, T. 21 N., R. 7 E.

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; soft, very friable, slightly sticky and slightly plastic; 5 percent pebbles; neutral; clear smooth boundary.

Bt1—4 to 11 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to strong fine and medium subangular blocky; hard, very friable, sticky and plastic; many fine and very fine roots; many very fine tubular pores; many distinct clay films on faces of peds; 5 percent pebbles; neutral; clear wavy boundary.

Bt2—11 to 16 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to strong fine angular blocky; hard, friable, sticky and plastic; many fine and very fine roots; many very fine tubular pores; many distinct clay films on faces of peds; 5 percent pebbles; neutral; clear wavy boundary.

Bk1—16 to 27 inches; light brownish gray (10YR 6/2) loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine and few fine tubular pores; 5 percent pebbles; common fine seams and masses of lime and lime disseminated; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—27 to 34 inches; pale brown (10YR 6/3) loam, grayish brown (10YR 5/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots, many very fine and

few fine tubular pores; 5 percent pebbles; few fine seams and masses of lime and lime disseminated; violently effervescent; moderately alkaline; clear wavy boundary.

2Bk3—34 to 44 inches; pale brown (10YR 6/3) extremely gravelly loamy sand, grayish brown (10YR 5/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; many irregular pores; 50 percent pebbles, 20 percent cobbles; lime coats on lower surfaces of rock fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

2C—44 to 60 inches; pale brown (10YR 6/3) extremely gravelly sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; 50 percent pebbles, and 20 percent cobbles; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches and may include all or part of the Bt horizon

Depth to the Bk horizon: 11 to 20 inches

Depth to the 2Bk horizon: 20 to 40 inches

A horizon

Hue: 10YR or 7.5YR

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 25 percent

Rock fragments: 0 to 50 percent—0 to 3 percent stones, 0 to 5 percent cobbles, 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizons

Hue: 7.5YR, 10YR, or 2.5Y

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

Chroma: 2 or 3

Texture: clay loam, sandy clay loam, loam

Clay content: 25 to 35 percent

Rock fragments: 0 to 30 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizons

Hue: 7.5YR, 10YR, or 2.5Y

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

Chroma: 2 or 3

Texture: loam, clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 30 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

2Bk3 horizon

Hue: 2.5Y or 10YR
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loamy sand or sand
 Clay content: 0 to 5 percent
 Rock fragments: 35 to 80 percent—5 to 20 percent
 cobbles, 30 to 60 percent pebbles
 Calcium carbonate equivalent: 2 to 12 percent
 Reaction: pH 7.4 to 8.4

2C horizon

Hue: 2.5Y or 10YR
 Chroma: 2, 3, or 4
 Texture: loamy sand or sand
 Clay content: 0 to 5 percent
 Rock fragments: 35 to 80 percent—5 to 20 percent
 cobbles, 30 to 60 percent pebbles
 Reaction: pH 7.4 to 8.4

451C—Turner-Beaverton complex, 2 to 8 percent slopes

Setting

Landform:

- * Turner—Relict stream terraces
- * Beaverton—Relict stream terraces
- * Beaverton—Relict stream terraces

Position on landform:

- * Turner—Treads
- * Beaverton—Treads
- * Beaverton—Treads

Slope:

- * Turner—2 to 4 percent
- * Beaverton—2 to 8 percent
- * Beaverton—2 to 8 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Turner and similar soils: 45 percent
 Beaverton and similar soils: 25 percent
 Beaverton and similar soils: 20 percent

Minor Components

Stony surface layers: 0 to 5 percent
 Slopes less than 2 percent: 0 to 3 percent
 Farnuf and similar soils: 0 to 2 percent

Major Component Description

Turner

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.1 inches

Beaverton

Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

Beaverton

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Twilight Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills
Parent material: Residuum from sandstone
Slope range: 8 to 45 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

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

Typical Pedon

Twilight fine sandy loam, in an area of Busby-Twilight fine sandy loams, 4 to 15 percent slopes, in rangeland, 2,200 feet west and 1,000 feet south of the northeast corner of sec. 12, T. 26 N., R. 6 E.

A—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine and very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; neutral; clear smooth boundary.

Bw—5 to 15 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and few fine tubular pores; neutral; clear wavy boundary.

C—15 to 30 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine and fine roots; many very fine and few fine tubular pores; mildly alkaline; clear wavy boundary.

Cr—30 to 60 inches; pale yellow (2.5Y 7/4) sandstone, light olive brown (2.5Y 5/6) moist.

Range in Characteristics

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

Depth to the Cr horizon: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Clay content: 5 to 18 percent

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: fine sandy loam, sandy loam

Clay content: 5 to 18 percent

Reaction: pH 6.6 to 7.8

C 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

Clay content: 5 to 18 percent

Reaction: pH 7.4 to 8.4

661E—Twilight-Fleak complex, 8 to 25 percent slopes**Setting***Landform:*

* Twilight—Hills

* Fleak—Hills

Position on landform:

* Twilight—Backslopes and footslopes

* Fleak—Backslopes and shoulders

Slope:

* Twilight—8 to 25 percent

* Fleak—8 to 25 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition**Major Components**

Twilight and similar soils: 50 percent

Fleak and similar soils: 35 percent

Minor Components

Busby and similar soils: 0 to 3 percent

Moderately deep, sandy soils: 0 to 3 percent

Slopes more than 25 percent: 0 to 3 percent

Yetull and similar soils: 0 to 2 percent

Yamacall and similar soils: 0 to 2 percent

Areas of rock outcrop: 0 to 2 percent

Major Component Description**Twilight**

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

Fleak

Surface layer texture: Loamy fine sand

Depth class: Shallow (10 to 20 inches)

Drainage class: Excessively drained

Dominant parent material: Sandstone residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Vanda Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Alluvial fans, stream terraces

Parent material: Alluvium

Slope range: 0 to 8 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Aridic Ustorthents

Typical Pedon

Vanda clay, in an area of Marvan-Vanda clays, 2 to 8 percent slopes, in rangeland, 1,700 feet north and 1,100 feet west of the southeast corner of sec. 7, T. 27 N., R. 8 E.

E—0 to 1 inch; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; vesicular crust; hard, friable, sticky and plastic; common fine and very fine roots; common very fine vesicular pores; mildly alkaline; abrupt smooth boundary.

Bw—1 to 5 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine angular blocky structure; extremely hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; slightly effervescent; strongly alkaline; clear wavy boundary.

By—5 to 12 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to weak fine subangular blocky; extremely hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; few fine seams of gypsum; slightly effervescent; strongly alkaline; clear wavy boundary.

Bnyz1—12 to 31 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, very sticky and very plastic; few fine and very fine roots; few very fine tubular pores;

common fine and medium masses and seams of gypsum and other salts; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bnyz2—31 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, very sticky and very plastic; few very fine tubular pores; common fine masses and seams of gypsum and other salts; slightly effervescent; moderately alkaline.

Range in Characteristics

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

Depth to the Bnyz horizon: 7 to 24 inches

E and Bw horizons

Hue: 2.5Y or 5Y

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

Chroma: 1, 2, or 3

Clay content: 40 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 5 to 30

Reaction: pH 7.9 to 9.6

By horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: clay, silty clay, silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Reaction: pH 7.9 to 9.6

Bnyz horizons

Hue: 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: clay, silty clay, silty clay loam

Clay content: 35 to 60 percent

Gypsum content: 1 to 5 percent with total gypsum less than 150

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Gypsum content: 1 to 5 percent

Reaction: pH 7.9 to 9.6

48A—Vanda clay, 0 to 2 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Vanda and similar soils: 85 percent

Minor Components

Marvan and similar soils: 0 to 10 percent
Stratified, loamy soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

48C—Vanda clay, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Vanda and similar soils: 85 percent

Minor Components

Marvan and similar soils: 0 to 10 percent
Stratified, loamy soils: 0 to 5 percent

Major Component Description

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

Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Vebar Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills
Parent material: Residuum from sandstone
Slope range: 8 to 25 percent
Annual precipitation: 14 to 17 inches
Annual air temperature: 41 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Coarse-loamy, mixed Typic Haploborolls

Typical Pedon

Vebar fine sandy loam, in an area of Tally-Vebar fine sandy loams, 8 to 25 percent slopes, in rangeland, 1,150 feet south and 500 feet east of the northwest corner of sec. 10, T. 20 N., R. 11 E.

A—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and slightly plastic; many fine roots; neutral; clear smooth boundary.

Bw1—7 to 12 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; many fine and very fine tubular pores; neutral; clear wavy boundary.

Bw2—12 to 17 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; moderate medium prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; many very fine tubular pores; neutral; clear wavy boundary.

BCk—17 to 31 inches; pale yellow (2.5Y 7/4) fine sandy loam, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, very friable, slightly sticky

and slightly plastic; common fine and very fine roots; many very fine tubular pores; common fine masses of lime and lime disseminated; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—31 to 60 inches; pale yellow (2.5Y 7/4) sandstone, light yellowish brown (2.5Y 6/4) moist; strongly effervescent in the upper part and slightly effervescent in the lower part; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 16 inches

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

Depth to the Bk horizon: 12 to 26 inches

Depth to the Cr horizon: 20 to 40 inches

A horizon

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

Chroma: 2 or 3

Clay content: 10 to 18 percent

Reaction: pH 6.1 to 7.8

Bw horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: fine sandy loam, sandy loam, loam

Clay content: 10 to 18 percent

Reaction: pH 6.1 to 8.4

BCk horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: fine sandy loam, sandy loam, loamy fine sand

Clay content: 10 to 18 percent

Reaction: pH 7.4 to 8.4

Vida Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Till plains, hills

Parent material: Glacial till

Slope range: 0 to 15 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Vida clay loam, in an area of Bearpaw-Vida clay loams, 4 to 8 percent slopes, in cropland, 500 feet east and 300 feet north of the southwest corner of sec. 15, T. 22 N., R. 8 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine granular structure; slightly hard, very friable, sticky and plastic; common fine roots; few cobbles, 5 percent pebbles; neutral; abrupt smooth boundary.

Bt—5 to 8 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium prismatic structure parting to moderate fine subangular blocky; very hard, firm, sticky and plastic; common fine roots; many very fine tubular pores; many faint clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

Bk1—8 to 15 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; few fine roots; many very fine and few fine tubular pores; few pebbles; lime disseminated and few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—15 to 38 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; few fine roots; many very fine tubular pores; few pebbles; common fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

BCy—38 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; common very fine tubular pores; 5 percent pebbles; common medium masses of gypsum decreasing with depth; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 10 inches (may include Bt horizon)

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

Depth to the Bk horizon: 6 to 10 inches

Ap horizon

Value: 3 or 4 dry, 2 or 3 moist
 Chroma: 2 or 3
 Texture: loam, clay loam
 Clay content: 20 to 30 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent
 cobbles and stones, 0 to 10 percent pebbles
 Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 10YR
 Value: 4 or 5 dry, 3 or 4 moist
 Chroma: 2 or 3
 Texture: loam, clay loam
 Clay content: 25 to 35 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent
 cobbles, 0 to 10 percent pebbles
 Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry, 5 or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, clay loam
 Clay content: 25 to 35 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent
 cobbles, 0 to 10 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

Bk2 and BCy horizon

Hue: 10YR or 2.5Y
 Value: 6 or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam, clay loam
 Clay content: 25 to 35 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent
 cobbles, 0 to 10 percent pebbles
 Calcium carbonate equivalent: 2 to 12 percent
 Gypsum content: 0 to 5 percent
 Reaction: pH 7.9 to 8.4

692D—Vida-Bearpaw clay loams, 4 to 15 percent slopes**Setting***Landform:*

- * Vida—Hills
- * Bearpaw—Hills

Position on landform:

- * Vida—Backslopes and shoulders
- * Bearpaw—Footslopes

Slope:

- * Vida—4 to 15 percent
- * Bearpaw—4 to 15 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition**Major Components**

Vida and similar soils: 55 percent
 Bearpaw and similar soils: 30 percent

Minor Components

Zahill and similar soils: 0 to 10 percent
 Very gravelly surface layers: 0 to 5 percent

Major Component Description**Vida**

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

Bearpaw

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

693C—Vida-Bearpaw-Nishon clay loams, 0 to 15 percent slopes**Setting***Landform:*

- * Vida—Hills
- * Bearpaw—Hills
- * Nishon—Closed depressions

Position on landform:

- * Vida—Backslopes and shoulders
- * Bearpaw—Backslopes and footslopes
- * Nishon—Toeslopes

Slope:

- * Vida—4 to 15 percent
- * Bearpaw—2 to 8 percent
- * Nishon—0 to 1 percent

Mean annual precipitation: 14 to 17 inches*Frost-free period:* 100 to 120 days**Composition****Major Components**

Vida and similar soils: 40 percent
 Bearpaw and similar soils: 25 percent
 Nishon and similar soils: 20 percent

Minor Components

Zahill and similar soils: 0 to 10 percent
 Waltham and similar soils: 0 to 2 percent
 Accl and similar soils: 0 to 2 percent
 Stratified loam to sand soils: 0 to 1 percent

Major Component Description**Vida**

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

Bearpaw

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Nishon

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Ponding: Long
Available water capacity: Mainly 9.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

691D—Vida-Williams loams, 8 to 15 percent slopes**Setting***Landform:*

- * Vida—Hills
- * Williams—Hills

Position on landform:

- * Vida—Backslopes and shoulders
- * Williams—Footslopes

Slope:

- * Vida—8 to 15 percent
- * Williams—8 to 15 percent

Mean annual precipitation: 14 to 17 inches*Frost-free period:* 100 to 120 days**Composition****Major Components**

Vida and similar soils: 55 percent
 Williams and similar soils: 30 percent

Minor Components

Zahill and similar soils: 0 to 7 percent
 Slopes less than 8 percent: 0 to 6 percent
 Nishon and similar soils: 0 to 2 percent

Major Component Description**Vida**

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Williams

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

Flooding: None

Available water capacity: Mainly 10.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

69C—Vida-Zahill clay loams, 2 to 8 percent slopes

Setting

Landform:

* Vida—Till plains

* Zahill—Till plains

Position on landform:

* Vida—Backslopes and footslopes

* Zahill—Backslopes and shoulders

Slope:

* Vida—2 to 8 percent

* Zahill—2 to 8 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Vida and similar soils: 50 percent

Zahill and similar soils: 35 percent

Minor Components

Bearpaw and similar soils: 0 to 10 percent

Williams and similar soils: 0 to 2 percent

Very gravelly surface layers: 0 to 2 percent

Very gravelly sandy loam soils: 0 to 1 percent

Major Component Description

Vida

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Zahill

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Waltham Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Very slow (<0.06 inch/hour)

Landform: Till plains

Parent material: Glacial till

Slope range: 0 to 4 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Waltham clay loam, in an area of Bearpaw-Waltham clay loams, 0 to 4 percent slopes, in rangeland, 500 feet south and 1,000 feet east of the northwest corner of sec. 28, T. 22 N., R. 9 E.

E—0 to 2 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; strong medium platy structure; hard, very friable, sticky and slightly plastic; common fine and very fine roots; few very fine tubular pores; neutral; abrupt smooth boundary.

Bt1—2 to 6 inches; dark grayish brown (2.5Y 4/2) clay, very dark grayish brown (2.5Y 3/2) moist; strong medium columnar structure parting to strong medium subangular blocky; extremely hard, very firm, very sticky and very plastic; common fine and very fine roots; few very fine tubular pores; many distinct clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bt2—6 to 11 inches; dark grayish brown (2.5Y 4/2) clay, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure parting to strong fine and medium subangular blocky; extremely hard,

very firm, very sticky and very plastic; common fine and very fine roots; common very fine tubular pores; many distinct clay films on faces of peds; mildly alkaline; clear wavy boundary.

Btkn—11 to 18 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, firm, very sticky and very plastic; common fine and very fine roots; common very fine tubular pores; few distinct clay films on faces of peds; few fine masses of lime; strongly effervescent; strongly alkaline; clear wavy boundary.

Bkny1—18 to 30 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; common fine masses of lime; common fine masses of gypsum; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkny2—30 to 44 inches; light yellowish brown (2.5Y 6/4) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine tubular pores; few fine masses of lime; few fine masses of gypsum; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bnyz—44 to 60 inches; light yellowish brown 2.5Y 6/4) clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine tubular pores; few fine masses of gypsum and other salts; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

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

Depth to the Btkn horizon: 10 to 16 inches

E horizon

Hue: 2.5Y or 10YR

Value: 6 or 7 dry, 4 or 5 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Sodium adsorption ratio: 0 to 13

Reaction: pH 6.6 to 8.4

An A horizon 1 or 2 inches thick, with granular structure above the E horizon is allowed

Bt horizons

Hue: 2.5Y or 10YR

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Clay content: 45 to 60 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 2 mmhos/cm

Sodium adsorption ratio: 4 to 13

Reaction: pH 7.4 to 8.4

Btkn horizon

Hue: 2.5Y or 10YR

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay loam, clay

Clay content: 35 to 45 percent

Rock fragments: 0 to 5 percent mainly pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 13 to 25

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

Bkny horizons

Hue: 2.5Y or 10YR

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

Chroma: 2, 3, or 4

Clay content: 27 to 40 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 4 to 20

Gypsum content: 3 to 5 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

Bnyz horizon

Hue: 2.5Y or 10YR

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

Chroma: 2, 3, or 4

Clay content: 27 to 40 percent

Rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 4 to 20

Gypsum content: 3 to 5 percent

Calcium carbonate equivalent: 5 to 12 percent

Reaction: pH 7.4 to 9.0

Warwood Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Mountains

Parent material: Colluvium or residuum from igneous rocks

Slope range: 15 to 45 percent
Annual precipitation: 20 to 28 inches
Annual air temperature: 38 to 42 degrees F
Frost-free period: 50 to 70 days

Taxonomic Class: Fine-loamy, mixed Glossic
 Cryoboralfs

Typical Pedon

Warwood loam, 15 to 45 percent slopes, in forest, 1,300 feet east and 1,700 feet north of the southwest corner of sec. 7, T. 20 N., R. 9 E.

Oi—2 inches to 0; forest litter of slightly decomposed needles, twigs, and leaves.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; strong fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine and common medium and coarse roots; 10 percent pebbles; medium acid; abrupt wavy boundary.

E—4 to 8 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure parting to strong medium granular; hard, very friable, slightly sticky and slightly plastic; many fine and very fine and common medium and coarse roots; many very fine tubular pores; 10 percent pebbles; medium acid; clear wavy boundary.

Bt/E—8 to 15 inches; Bt part (60 percent) is brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; E part (40 percent) is light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist tonguing into the Bt part; strong fine and medium subangular blocky structure; very hard, friable, sticky and plastic; common fine and very fine and few medium and coarse roots; many very fine tubular pores; common distinct clay films on faces of peds of the Bt part; 5 percent pebbles; medium acid; gradual wavy boundary.

Bt1—15 to 24 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; very hard, friable, sticky and plastic; common fine and very fine roots; many very fine tubular pores; common faint clay films on faces of peds; 5 percent pebbles; medium acid; clear wavy boundary.

Bt2—24 to 38 inches; pale brown (10YR 6/3) clay loam, dark grayish brown (10YR 4/2) moist; strong fine and medium subangular blocky structure; very hard, friable, sticky and plastic;

common fine and very fine roots; many very fine tubular pores; common faint clay films on faces of peds; 5 percent pebbles; medium acid; clear wavy boundary.

BC—38 to 60 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; few fine and very fine roots; many very fine tubular pores; 10 percent pebbles; few fine seams of lime below 50 inches; neutral.

Range in Characteristics

Content of clay in the control section: 27 to 35 percent

Rock fragments in the control section: 5 to 25 percent

Depth to the Bt horizon: 12 to 24 inches

A horizon

Value: 4 or 5 dry, 2 or 3 moist

Clay content: 20 to 27 percent

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

Reaction: pH 5.6 to 6.5

Some pedons do not have an A horizon

E horizon

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: loam, sandy loam

Clay content: 15 to 27 percent

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

Reaction: pH 5.6 to 6.5

Bt/E horizon

Value: Bt part 4 or 5, E part 5 or 6 dry; Bt part 3 or 4 moist, E part 4 moist

Chroma: 2 or 3

Texture: sandy clay loam, clay loam (mixed)

Clay content: 20 to 35 percent

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

Reaction: pH 5.6 to 6.5

Bt1 horizon

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Rock fragments: 5 to 25 percent—5 to 20 percent pebbles, 0 to 5 percent cobbles

Reaction: pH 6.1 to 7.3

Bt2 and BC horizons

Value: 5 or 6 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: clay loam, sandy clay loam
 Clay content: 20 to 35 percent
 Rock fragments: 5 to 25 percent—5 to 20 percent pebbles, 0 to 5 percent cobbles
 Reaction: pH 6.1 to 7.3

530F—Warwood loam, 15 to 45 percent slopes

Setting

Landform: Mountains
Slope: 15 to 45 percent
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components

Warwood and similar soils: 85 percent

Minor Components

Ambrant and similar soils: 0 to 5 percent
 Moderately deep, loamy soils: 0 to 5 percent
 Very gravelly clay loam soils: 0 to 3 percent
 Soils with a clay subsoil: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium or residuum
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 9.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

W—Water

Composition

Major Components

Water: 100 percent

Major Component Description

Definition: Areas of open water

Wayden Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills, escarpments
Parent material: Residuum from shale
Slope range: 8 to 70 percent
Annual precipitation: 14 to 17 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 100 to 120 days

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents

Typical Pedon

Wayden silty clay loam, in an area of Wayden-Sagedale silty clay loams, 25 to 60 percent slopes, in rangeland, 1,400 feet east and 900 feet north of the southwest corner of sec. 20, T. 21 N., R. 12 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; many fine and common medium roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bky—3 to 12 inches; grayish brown (2.5Y 5/2) silty clay loam, olive brown (2.5Y 4/3) moist; weak medium subangular blocky structure; hard, friable, sticky and very plastic; common fine and very fine roots; common very fine tubular pores; common fine seams of lime and gypsum; violently effervescent; moderately alkaline; clear wavy boundary.

BCy—12 to 18 inches; light brownish gray (2.5Y 6/2) silty clay loam, light olive brown (2.5Y 5/4) moist; platy rock structure; hard, friable, very sticky and very plastic; common fine and very fine roots; 70 percent soft shale chips; many fine and medium masses of gypsum; violently effervescent; mildly alkaline; clear smooth boundary.

Cr—18 to 60 inches; light brownish gray and light yellowish brown (2.5Y 6/2 and 6/4) shale, light olive brown 2.5Y, 5/4) moist; slightly effervescent; mildly alkaline.

Range in Characteristics

Content of clay in the control section: 35 to 50 percent
Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 2.5Y or 5Y

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

Chroma: 2 or 3
 Clay content: 35 to 40 percent
 Reaction: pH 7.4 to 8.4

Bky and BCy horizons

Hue: 2.5Y or 5Y
 Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 1, 2, 3, or 4
 Texture: silty clay loam, clay loam, silty clay
 Clay content: 35 to 50 percent
 Reaction: pH 7.4 to 8.4

**621F—Wayden-Sagedale silty clay loams,
 25 to 60 percent slopes**

Setting

Landform:

- * Wayden—Hills
- * Sagedale—Hills

Position on landform:

- * Wayden—Backslopes and shoulders
- * Sagedale—Footslopes

Slope:

- * Wayden—25 to 60 percent
- * Sagedale—25 to 45 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Wayden and similar soils: 50 percent
 Sagedale and similar soils: 35 percent

Minor Components

Macar and similar soils: 0 to 5 percent
 Cabba and similar soils: 0 to 5 percent
 Areas of rock outcrop: 0 to 3 percent
 Stony surface layers: 0 to 1 percent
 Bouldery surface layers: 0 to 1 percent

Major Component Description

Wayden

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

Sagedale

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.4 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Weingart Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Very slow (<0.06 inch/hour)
Landform: Sedimentary plains
Parent material: Residuum from interbedded shale and sandstone
Slope range: 0 to 2 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Fine, montmorillonitic Typic Natriboralfs

Typical Pedon

Weingart clay loam, in an area of Megonot-Weingart-Delpoint complex, 0 to 4 percent slopes, in rangeland, 1,450 feet west and 50 feet north of the southeast corner of sec. 20, T. 25 N., R. 16 E.

E—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine tubular pores; neutral; abrupt smooth boundary.

Btn—3 to 10 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; strong medium columnar structure parting to strong fine and medium subangular blocky; very hard, firm, sticky and very plastic; common fine and very fine roots; few very fine tubular pores; many faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bkn—10 to 17 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; common fine masses of lime; violently effervescent; strongly alkaline; clear wavy boundary.

Bknyz—17 to 28 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; many very fine tubular pores; common fine masses of lime; few fine masses of gypsum and other salts; violently effervescent; strongly alkaline; gradual wavy boundary.

Cr—28 to 60 inches; light gray and light brownish gray (5Y 6/1 and 2.5Y 6/2) interbedded shale and sandstone, dark gray (5Y 4/1) moist; common fine masses of lime, gypsum, and other salts in the upper part; slightly effervescent; strongly alkaline.

Range in Characteristics

Content of clay in the control section: 40 to 60 percent

Depth to the Bk horizon: 8 to 14 inches

Depth to the Bkyz horizon: 12 to 24 inches

Depth to the Cr horizon: 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

Clay content: 20 to 27 percent

Rock fragments: 0 to 10 percent—0 to 10 percent stones and cobbles, 0 to 5 percent hard shale, 0 to 5 percent soft shale

Reaction: pH 5.6 to 7.8

Btn horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2, 3, or 4

Texture: clay, silty clay, sandy clay

Clay content: 40 to 60 percent

Rock fragments: 0 to 10 percent—0 to 5 percent hard shale, 0 to 5 percent soft shale

Electrical conductivity: 0 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 30

Reaction: pH 7.4 to 9.6

When the SAR is less than 13, there is more

exchangeable magnesium plus sodium than calcium plus exchange acidity

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, clay, sandy clay, silty clay loam

Clay content: 35 to 55 percent

Rock fragments: 0 to 10 percent—0 to 5 percent

hard shale, 0 to 5 percent soft shale

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Lime: few to common masses

Gypsum content: none to common seams, 0 to 2 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.6

Bknyz horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 1, 2, 3, or 4

Texture: clay, silty clay, clay loam, silty clay loam

Clay content: 35 to 55 percent

Rock fragments: 0 to 10 percent—0 to 5 percent

hard shale, 0 to 5 percent soft shale

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Gypsum content: 1 to 5 percent

Calcium carbonate equivalent: 2 to 12 percent

Reaction: pH 7.9 to 9.6

Cr horizon

Material: interbedded shale and sandstone

Reaction: greater than 7.8

Whitlash Series

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Mountains, hills

Parent material: Residuum from igneous rocks

Slope range: 8 to 70 percent

Annual precipitation: 15 to 22 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed Lithic Haploborolls

Typical Pedon

Whitlash very cobbly loam, in an area of Perma-Whitlash complex, 25 to 70 percent slopes, in rangeland, 1,500 feet north and 1,000 feet east of the southwest corner of sec. 5, T. 28 N., R. 15 E.

A—0 to 6 inches; dark grayish brown (10YR 4/2) very cobbly loam, very dark brown (10YR 2/2) moist; strong fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine and few medium roots; 15 percent cobbles, 20 percent pebbles; slightly acid; clear wavy boundary.

Bw—6 to 15 inches; grayish brown (10YR 5/2) extremely cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many very fine and fine irregular pores; 40 percent cobbles, 20 percent pebbles; neutral.

R—15 inches; hard fractured igneous bedrock.

Range in Characteristics

Mollic epipedon thickness: 7 to 20 inches

Content of clay in the control section: 10 to 27 percent

Rock fragments in the control section: 35 to 75 percent

Depth to bedrock: 10 to 20 inches

A horizon

Value: 3 or 4 dry, 2 or 3 moist

Chroma: 1, 2, or 3

Clay content: 10 to 27 percent and less than 35 percent fine and coarser sand

Rock fragments: 15 to 60 percent—15 to 35 percent pebbles or channers, 0 to 30 percent cobbles, flagstones, or stones

Rock fragments, surface cover: 0.01 to 3 percent stones

Reaction: pH 6.1 to 7.3

Bw horizon

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: loam, sandy clay loam, or sandy loam
Clay content: 10 to 27 percent and less than 35 percent fine and coarser sand

Rock fragments: 35 to 80 percent—15 to 60 percent pebbles or channers, 5 to 50 percent cobbles, flagstones, or stones

Reaction: pH 6.1 to 7.3

Some pedons have a C horizon

892F—Whitlash-Belain-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform:

* Whitlash—Hills

* Belain—Hills

* Rock outcrop—Hills

Position on landform:

* Whitlash—Backslopes and shoulders

* Belain—Backslopes and footslopes

* Rock outcrop—Shoulders and summits

Slope:

* Whitlash—25 to 60 percent

* Belain—25 to 45 percent

Mean annual precipitation: 15 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Whitlash and similar soils: 35 percent

Belain and similar soils: 30 percent

Rock outcrop: 20 percent

Minor Components

Hedoes and similar soils: 0 to 5 percent

Perma and similar soils: 0 to 5 percent

Soils with ponderosa pine: 0 to 5 percent

Major Component Description

Whitlash

Surface layer texture: Very cobbly loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

Belain

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Igneous residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.7 inches

Rock outcrop

Definition: Exposures of igneous bedrock

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Williams Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Till plains, hills

Parent material: Glacial till

Slope range: 0 to 15 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

Taxonomic Class: Fine-loamy, mixed Typic Argiborolls

Typical Pedon

Williams loam, in an area of Vida-Williams loams, 8 to 15 percent slopes, in rangeland, 2,300 feet east and 2,200 feet south of the northwest corner of sec. 22, T. 23 N., R. 9 E.

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

Bt1—5 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium prismatic structure parting to strong fine and medium subangular blocky; hard, friable, sticky and plastic; many very fine and fine roots; many very fine tubular pores; common faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bt2—9 to 16 inches; grayish brown (10YR 5/2) clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; common very fine and fine roots; many very fine tubular pores; common faint clay films on faces of peds; mildly alkaline; clear wavy boundary.

Bk1—16 to 32 inches; pale brown (10YR 6/3) clay loam, grayish brown (10YR 5/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; few very fine and fine roots; many very fine tubular pores; many fine and medium masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—32 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; weak medium subangular blocky structure; friable, sticky and plastic; few very fine roots; common very fine and tubular pores; 5 percent pebbles; few fine masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 7 to 15 inches and may include all or part of the Bt horizons

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

Depth to the Bk horizon: 10 to 25 inches

A horizon

Hue: 10YR

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

Chroma: 2 (some pedons in native grassland have a moist chroma of less than 1.5 in the upper 1 to 3 inches)

Clay content: 15 to 27 percent

Reaction: pH 6.6 to 7.3

Bt horizons

Hue: 10YR or 2.5Y

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

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 25 to 35 percent

Structure: strong or moderate, medium or coarse prismatic that parts to strong or moderate, medium, or fine angular, or subangular blocky

Reaction: pH 6.6 to 7.8

Bk horizons

Hue: 10YR, 2.5Y, or 5Y

Value: 4, 5, 6, 7, or 8 dry; 3, 4, 5, or 6 moist

Chroma: 2 to 4

Texture: loam or clay loam

Clay content: 22 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Some pedons have a BC or Bk horizon

801B—Williams-Vida loams, 0 to 4 percent slopes**Setting***Landform:*

- * Williams—Till plains
- * Vida—Till plains

Position on landform:

- * Williams—Foothills and toeslopes
- * Vida—Backslopes and shoulders

Slope:

- * Williams—0 to 4 percent
- * Vida—0 to 4 percent

Mean annual precipitation: 14 to 17 inches*Frost-free period:* 100 to 120 days**Composition****Major Components**

Williams and similar soils: 50 percent
 Vida and similar soils: 35 percent

Minor Components

Zahill and similar soils: 0 to 9 percent
 Tally and similar soils: 0 to 5 percent
 Nishon and similar soils: 0 to 1 percent

Major Component Description**Williams***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.5 inches**Vida***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.7 inches**Management**

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

801C—Williams-Vida loams, 4 to 8 percent slopes**Setting***Landform:*

- * Williams—Till plains
- * Vida—Till plains

Position on landform:

- * Williams—Foothills and toeslopes
- * Vida—Backslopes and shoulders

Slope:

- * Williams—4 to 8 percent
- * Vida—4 to 8 percent

Mean annual precipitation: 14 to 17 inches*Frost-free period:* 100 to 120 days**Composition****Major Components**

Williams and similar soils: 50 percent
 Vida and similar soils: 35 percent

Minor Components

Zahill and similar soils: 0 to 9 percent
 Tally and similar soils: 0 to 5 percent
 Nishon and similar soils: 0 to 1 percent

Major Component Description**Williams***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 10.5 inches**Vida***Surface layer texture:* Loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Till*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 9.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Winifred Series

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Hills

Parent material: Residuum from shale

Slope range: 15 to 45 percent

Annual precipitation: 17 to 19 inches

Annual air temperature: 41 to 44 degrees F

Frost-free period: 90 to 110 days

Taxonomic Class: Fine, montmorillonitic Typic Haploborolls

Typical Pedon

Winifred clay loam, in an area of Linwell-Winifred clay loams, 15 to 45 percent slopes, in rangeland, 200 feet west and 500 feet north of the southeast corner of sec. 13, T. 21 N., R. 8 E.

A—0 to 4 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong medium granular structure; hard, friable, sticky and plastic; many fine and very fine and common medium roots; mildly alkaline; clear smooth boundary.

Bw—4 to 15 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many fine and very fine and common medium roots; many very fine tubular pores; mildly alkaline; clear wavy boundary.

Bk1—15 to 24 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common fine and very fine and few medium roots; common very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk2—24 to 34 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky

structure; hard, friable, sticky and plastic; common fine and very fine roots; many very fine tubular pores; common fine seams and masses of lime; strongly effervescent; gradual wavy boundary.

Cr—34 inches; light brownish gray (2.5Y 6/2) and grayish brown (2.5Y 5/2) shale, grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) moist; slightly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 8 to 15 inches

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

Depth to bedrock: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Clay content: 27 to 40 percent

Rock fragments: 0 to 35 percent—0 to 20 percent

cobbles, 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry, 3 or 4 moist

Chroma: 2 or 3

Texture: clay loam, silty clay, clay, silty clay loam

Clay content: 35 to 50 percent

Rock fragments: 0 to 15 percent—0 to 10 percent

cobbles, 0 to 5 percent pebbles

Effervescence: none to strongly

Reaction: pH 7.4 to 8.4

Bk horizons

Hue: 10YR or 2.5Y

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

Chroma: 2 or 3

Texture: clay, silty clay, silty clay loam, clay loam

Clay content: 35 to 50 percent

Rock fragments: 0 to 15 percent—0 to 10 percent

cobbles, 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Gypsum: 1 to 5 percent

Reaction: pH 7.4 to 9.0

Winkler Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Somewhat excessively drained

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

Landform: Mountains

Parent material: Colluvium from igneous rocks

Slope range: 25 to 60 percent
Annual precipitation: 18 to 22 inches
Annual air temperature: 40 to 43 degrees F
Frost-free period: 70 to 100 days

Taxonomic Class: Loamy-skeletal, mixed, frigid Typic Ustochrepts

Typical Pedon

Winkler gravelly sandy loam, in an area of Winkler-Ambrant complex, 25 to 60 percent slopes, in forest, 2,200 feet south and 1,400 feet west of the northeast corner of sec. 2, T. 28 N., R. 15 E.

O—2 inches to 0; slightly decomposed forest litter.

A—0 to 3 inches; dark grayish brown (10YR 4/2) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; strong fine and very fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine and common medium roots; 15 percent angular pebbles; slightly acid; clear smooth boundary.

E—3 to 10 inches; light brownish gray (10YR 6/2) gravelly sandy loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine and common medium roots; many very fine tubular pores; 25 percent angular pebbles; neutral; clear wavy boundary.

E and Bt—10 to 18 inches; E part (60 percent) is light brownish gray (10YR 6/2) very gravelly sandy loam, grayish brown (10YR 5/2) moist that surrounds the B part; B part (40 percent) is brown (10YR 5/3) very gravelly sandy loam lamellae, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine and few medium roots; many very fine tubular pores; 35 percent angular pebbles, 5 percent cobbles; neutral; gradual wavy boundary.

Bw1—18 to 36 inches; brown (10YR 5/3) extremely gravelly sandy loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; common fine, very fine and few medium roots; many very fine tubular and irregular pores; 55 percent angular pebbles, 10 percent cobbles; slightly acid; gradual wavy boundary.

Bw2—36 to 60 inches; brown (10YR 5/3) extremely gravelly sandy loam, dark brown (10YR 4/3) moist;

weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, and nonplastic; few fine and very fine roots; many very fine tubular and irregular pores; 65 percent angular pebbles, 10 percent cobbles; neutral.

Range in Characteristics

Content of clay in the control section: 5 to 15 percent
Rock fragments in the control section: 60 to 85 percent

A horizon

Hue: 7.5YR or 10YR
 Value: 3 or 4 moist
 Chroma: 2 or 3
 Clay content: 5 to 15 percent
 Rock fragments: 15 to 60 percent—0 to 5 percent angular cobbles, 15 to 55 percent angular pebbles
 Reaction: pH 6.1 to 7.3

E horizon

Hue: 7.5YR or 10YR
 Value: 6, 7, or 8 dry; 5, 6, or 7 moist
 Chroma: 2, 3, or 4
 Texture: sandy loam or loam
 Clay content: 5 to 15 percent
 Rock fragments: 15 to 60 percent—0 to 5 percent angular cobbles, 15 to 55 percent angular pebbles
 Reaction: pH 6.1 to 7.3

E and Bt horizon

Hue: E part 2.5Y, 7.5YR, or 10YR; B part 2.5Y, 5YR, 7.5YR, or 10YR
 Value: E part 6, 7, or 8, B part 4, 5, or 6 dry; E part 5, 6, or 7, B part 4 or 5 moist
 Chroma: E part 2, 3, or 4; B part 3 or 4
 Texture: fine sandy loam, sandy loam, or loam
 Clay content: 5 to 15 percent, lamellae have less than 5 percent increase in clay
 Rock fragments: 60 to 85 percent—10 to 25 percent angular cobbles, 50 to 60 percent angular pebbles
 Reaction: pH 5.6 to 6.5

Bw horizons

Hue: 7.5YR or 10YR
 Value: 5, 6, or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: sandy loam or fine sandy loam
 Clay content: 5 to 15 percent
 Rock fragments: 60 to 85 percent—10 to 25 percent angular cobbles, 50 to 60 percent angular pebbles
 Reaction: pH 5.6 to 7.3

680F—Winkler-Ambrant complex, 25 to 60 percent slopes

Setting

Landform:

- * Winkler—Mountains
- * Ambrant—Mountains
- * Winkler—Mountains

Position on landform:

- * Winkler—Backslopes and footslopes
- * Ambrant—Backslopes and footslopes
- * Winkler—Backslopes and footslopes

Slope:

- * Winkler—25 to 60 percent, northeast aspect
- * Ambrant—25 to 60 percent
- * Winkler—25 to 60 percent, southwest aspect

Mean annual precipitation: 18 to 22 inches

Frost-free period: 70 to 100 days

Composition

Major Components

Winkler and similar soils: 35 percent
 Ambrant and similar soils: 25 percent
 Winkler and similar soils: 25 percent

Minor Components

Perma and similar soils: 0 to 5 percent
 Belain and similar soils: 0 to 4 percent
 Whitlash and similar soils: 0 to 2 percent
 Lacey creek, cool soils: 0 to 2 percent
 Eagle creek and similar soils: 0 to 2 percent

Major Component Description

Winkler

Surface layer texture: Gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Igneous colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 3.1 inches

Ambrant

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium or residuum
Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.7 inches

Winkler

Surface layer texture: Gravelly sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Igneous colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 3.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Work Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow (0.2 to 0.6 inch/hour)
Landform: Alluvial fans, stream terraces, hills
Parent material: Alluvium
Slope range: 0 to 35 percent
Annual precipitation: 17 to 19 inches
Annual air temperature: 41 to 44 degrees F
Frost-free period: 90 to 110 days

Taxonomic Class: Fine, montmorillonitic Typic Argiborolls

Typical Pedon

Work clay loam, 4 to 8 percent slopes, in cropland, 1,250 feet east and 200 feet north of the southwest corner of sec. 14, T. 21 N., R. 9 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine and medium granular structure; soft, very friable, sticky and plastic; common fine and very fine roots; neutral; abrupt smooth boundary.

Bt1—6 to 14 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable, sticky and plastic; common fine and very fine roots; common very fine tubular

pores; many distinct clay films on faces of peds; neutral; clear wavy boundary.

Bt2—14 to 22 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to strong fine and medium subangular blocky; very hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; common distinct clay films on faces of peds; mildly alkaline; clear wavy boundary.

Btk—22 to 36 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure parting to strong fine and medium subangular blocky; very hard, firm, sticky and plastic; few very fine and fine roots; common very fine tubular pores; few faint clay films on faces of peds; few fine masses of lime; slightly effervescent; mildly alkaline; clear wavy boundary.

Bk—36 to 48 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure; hard, friable, sticky and plastic; few fine roots; many very fine tubular pores; 10 percent pebbles; common fine seams of lime; strongly effervescent; mildly alkaline; clear wavy boundary.

Bck—48 to 60 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, sticky and plastic; many very fine tubular pores; common fine seams of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Mollic epipedon thickness: 10 to 16 inches (includes all or part of the Bt horizons)

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

Depth to the Btk horizon: 12 to 30 inches

Ap horizon

Value: 4 or 5 dry, 2 or 3 moist

Chroma: 2 or 3

Texture: loam or clay loam

Clay content: 20 to 35 percent

Rock fragments: 0 to 60 percent—0 to 30 percent stones or cobbles, 0 to 30 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizons

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

Chroma: 2 or 3

Texture: clay loam, clay, silty clay

Clay content: 35 to 50 percent and more than 15 percent fine sand and coarser

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

Reaction: pH 6.6 to 7.8

Btk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry, 4 or 5 moist

Chroma: 2 or 3

Texture: clay or clay loam

Clay content: 20 to 40 percent

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

Calcium carbonate equivalent: 3 to 12 percent

Reaction: pH 7.4 to 7.8

Bk and Bck horizons

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

Clay content: 15 to 40 percent

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

Calcium carbonate equivalent: 5 to 15 percent

86B—Work clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Work and similar soils: 85 percent

Minor Components

Absarokee and similar soils: 0 to 5 percent

Work loam: 0 to 3 percent

Cobbly surface layers: 0 to 3 percent

Very gravelly substratums: 0 to 2 percent

Farnuf and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

86C—Work clay loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans and stream terraces
Slope: 4 to 8 percent
Mean annual precipitation: 17 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Work and similar soils: 85 percent

Minor Components

Absarokee and similar soils: 0 to 5 percent
 Work loam: 0 to 3 percent
 Cobbly surface layers: 0 to 3 percent
 Farnuf and similar soils: 0 to 2 percent
 Very gravelly substratums: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

86D—Work clay loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Mean annual precipitation: 17 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Work and similar soils: 85 percent

Minor Components

Absarokee and similar soils: 0 to 5 percent
 Very cobbly surface layers: 0 to 5 percent
 Roy and similar soils: 0 to 3 percent
 Very gravelly substratums: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

701E—Work-Absarokee clay loams, 8 to 25 percent slopes

Setting

Landform:
 * Work—Hills
 * Absarokee—Hills
Position on landform:
 * Work—Footslopes
 * Absarokee—Backslopes
Slope:
 * Work—8 to 15 percent
 * Absarokee—8 to 25 percent

Mean annual precipitation: 17 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Work and similar soils: 50 percent
 Absarokee and similar soils: 35 percent

Minor Components

Cabba and similar soils: 0 to 5 percent
 Stony surface layers: 0 to 5 percent
 Whitlash and similar soils: 0 to 2 percent
 Perma and similar soils: 0 to 2 percent
 Areas of rock outcrop: 0 to 1 percent

Major Component Description

Work

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.1 inches

Absarokee

Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

702E—Work-Absarokee stony loams, 8 to 35 percent slopes

Setting

Landform:

- * Work—Hills
- * Absarokee—Hills

Position on landform:

- * Work—Footslopes
- * Absarokee—Backslopes

Slope:

- * Work—8 to 35 percent
- * Absarokee—8 to 35 percent

Mean annual precipitation: 17 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components

Work and similar soils: 50 percent
 Absarokee and similar soils: 40 percent

Minor Components

Reeder and similar soils: 0 to 3 percent
 Whitlash and similar soils: 0 to 2 percent
 Very stony surface layers: 0 to 1 percent
 Bouldery surface layers: 0 to 1 percent
 Perma and similar soils: 0 to 2 percent
 Areas of rock outcrop: 0 to 1 percent

Major Component Description

Work

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.0 inches

Absarokee

Surface layer texture: Stony loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.8 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

863E—Work-Roy complex, 8 to 25 percent slopes

Setting

Landform:

- * Work—Alluvial fans
- * Roy—Alluvial fans

Slope:

- * Work—8 to 25 percent
- * Roy—8 to 25 percent

Mean annual precipitation: 17 to 19 inches

Frost-free period: 90 to 110 days

Composition

Major Components

Work and similar soils: 50 percent
Roy and similar soils: 40 percent

Minor Components

Thick, dark surface layers: 0 to 5 percent
Very cobbly sandy loam soils: 0 to 3 percent
Farnuf and similar soils: 0 to 2 percent

Major Component Description

Work

Surface layer texture: Cobbly loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.0 inches

Roy

Surface layer texture: Stony loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Yamacall Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Moderate (0.6 to 2.0 inches/hour)

Landform: Alluvial fans, stream terraces, small drainageways

Parent material: Alluvium

Slope range: 0 to 15 percent

Annual precipitation: 11 to 14 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 105 to 125 days

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

Typical Pedon

Yamacall loam, 0 to 4 percent slopes, in rangeland, 1,650 feet east and 300 feet south of the northwest corner of sec. 24, T. 26 N., R. 11 E.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; mildly alkaline; clear smooth boundary.

Bw—4 to 12 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium and coarse prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine tubular pores; slightly effervescent; mildly alkaline; clear wavy boundary.

Bk—12 to 18 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium prismatic structure parting to weak fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine tubular pores; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bck—18 to 26 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; common fine and few medium masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—26 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine tubular pores; slightly effervescent; moderately alkaline.

Range in Characteristics

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

Depth to the Bk horizon: 10 to 20 inches

Soil phases: Calcareous

A horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam or clay loam

Clay content: 18 to 35 percent

Rock fragments: 0 to 15 percent—0 to 5 percent

cobbles, 0 to 10 percent pebbles

Effervescence: none to strongly

Reaction: pH 6.6 to 8.4

This horizon when mixed to 7 inches will not meet the requirements for a mollic epipedon

Bw horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam, clay loam, or silt loam

Clay content: 18 to 35 percent with 15 to 35 percent fine sand and coarser

Rock fragments: 0 to 15 percent—0 to 5 percent

cobbles, 0 to 10 percent pebbles

Effervescence: none to strongly

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y

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

Chroma: 2, 3, or 4

Texture: loam, clay loam, or silt loam

Clay content: 18 to 35 percent with 15 to 35 percent fine sand and coarser

Rock fragments: 0 to 15 percent—0 to 5 percent

cobbles, 0 to 10 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Effervescence: strongly or violently

Reaction: pH 7.9 to 9.0

Some pedons have a BC horizon

BCK 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, fine sandy loam, clay loam, or silt loam; in some pedons below a depth of 40 inches the material consists of strata of loam, silt loam, sandy loam, and loamy sand

Clay content: 15 to 35 percent

Rock fragments: 0 to 25 percent—0 to 5 percent cobbles, 0 to 20 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

793B—Yamacall clay loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Stratified, sandy substratum: 0 to 10 percent

Saline and sodic soils: 0 to 5 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

793C—Yamacall clay loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 4 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Stratified, sandy substratums: 0 to 8 percent

Saline and sodic soils: 0 to 3 percent

Silty clay surface layers: 0 to 2 percent

Very gravelly surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.3 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

79B—Yamacall loam, 0 to 4 percent slopes

Setting

Landform: Alluvial fans, stream terraces, and drainageways

Slope: 0 to 4 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Calcareous surface layers: 0 to 10 percent

Yamacall fine sandy loam: 0 to 3 percent

Busby and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

79C—Yamacall loam, 4 to 8 percent slopes

Setting

Landform: Alluvial fans

Slope: 4 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Calcareous surface layers: 0 to 8 percent

Saline and sodic soils: 0 to 3 percent

Yamacall fine sandy loam: 0 to 2 percent

Busby and similar soils: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

79D—Yamacall loam, 8 to 15 percent slopes

Setting

Landform: Alluvial fans

Slope: 8 to 15 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yamacall and similar soils: 85 percent

Minor Components

Calcareous surface layers: 0 to 5 percent
 Very gravelly surface layers: 0 to 2 percent
 Saline and sodic soils: 0 to 2 percent
 Busby and similar soils: 0 to 2 percent
 Delpoint and similar soils: 0 to 2 percent
 Slopes more than 15 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

795C—Yamacall-Benz clay loams, 2 to 8 percent slopes

Setting

Landform:

* Yamacall—Alluvial fans

* Benz—Alluvial fans

Slope:

* Yamacall—2 to 8 percent

* Benz—2 to 8 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yamacall and similar soils: 50 percent

Benz and similar soils: 35 percent

Minor Components

Strongly saline, loamy soils: 0 to 5 percent

Marvan and similar soils: 0 to 5 percent

Vanda and similar soils: 0 to 3 percent

Busby and similar soils: 0 to 2 percent

Major Component Description

Yamacall

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.3 inches

Benz

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

795D—Yamacall-Benz clay loams, 8 to 15 percent slopes

Setting

Landform:

* Yamacall—Alluvial fans

* Benz—Alluvial fans

Slope:

* Yamacall—8 to 15 percent

* Benz—8 to 15 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yamacall and similar soils: 50 percent

Benz and similar soils: 35 percent

Minor Components

Strongly saline, loamy soils: 0 to 5 percent

Marvan and similar soils: 0 to 5 percent

Vanda similar soils: 0 to 3 percent

Busby and similar soils: 0 to 2 percent

Major Component Description

Yamacall

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.3 inches

Benz

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within 30 inches

Sodium affected: Sodic within 30 inches

Available water capacity: Mainly 6.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

605C—Yamacall-Havre loams, 0 to 8 percent slopes

Setting

Landform:

* Yamacall—Alluvial fans and stream terraces

* Havre—Flood plains

Slope:

* Yamacall—2 to 8 percent

* Havre—0 to 2 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yamacall and similar soils: 45 percent

Havre and similar soils: 40 percent

Minor Components

Busby and similar soils: 0 to 3 percent

Glendive and similar soils: 0 to 3 percent

Strongly saline soils: 0 to 3 percent

Kobase and similar soils: 0 to 2 percent

Very gravelly soils: 0 to 2 percent

Poorly drained soils: 0 to 2 percent

Major Component Description

Yamacall

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.7 inches

Havre

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: Mainly 9.7 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Yawdim Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow (0.06 to 0.2 inch/hour)
Landform: Hills, escarpments
Parent material: Residuum from shale
Slope range: 25 to 70 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Aridic Ustorthents

Typical Pedon

Yawdim silty clay loam, in an area of Mego-not-Yawdim silty clay loams, 25 to 60 percent slopes, in rangeland, 3,200 feet west and 2,400 feet south of the northeast corner of sec. 30, T. 25 N., R. 9 E.

- A—0 to 3 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; soft, friable, sticky and plastic; few very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.
- C—3 to 16 inches; grayish brown (2.5Y 5/2) silty clay loam, olive brown (2.5Y 4/4) moist; weak fine platy structure; hard, firm, sticky and plastic; few very fine roots; 60 percent soft shale chips; slightly effervescent; mildly alkaline; gradual wavy boundary.
- Cr—16 to 60 inches; light brownish gray (2.5Y 6/2) shale, olive brown (2.5Y 4/4) moist; few very fine roots following plates in upper part; slightly effervescent; mildly alkaline.

Range in Characteristics

Content of clay in the control section: 35 to 50 percent
Depth to the Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y
 Value: 5 or 6 dry, 3 or 4 moist
 Chroma: 1 or 2
 Clay content: 27 to 40 percent
 Reaction: pH 6.6 to 7.8

C horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, 7, or 8 dry; 4, 5, or 6 moist
 Chroma: 1, 2, 3, or 4
 Texture: silty clay loam, clay loam, or clay
 Clay content: 35 to 50 percent
 Reaction: pH 7.4 to 8.4

Yetull Series

Depth class: Very deep (greater than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Rapid (6.0 to 20.0 inches/hour)
Landform: Sand dunes, hills
Parent material: Alluvium, eolain deposits
Slope range: 0 to 70 percent
Annual precipitation: 11 to 14 inches
Annual air temperature: 42 to 45 degrees F
Frost-free period: 105 to 125 days

Taxonomic Class: Mixed, frigid Typic Ustipsamments

Typical Pedon

Yetull loamy fine sand, in an area of Chinook-Yetull complex, 2 to 10 percent slopes, in cropland, 1,200 feet south and 800 feet west of the northeast corner of sec. 27, T. 24 N., R. 7 E.

- Ap—0 to 6 inches; pale brown (10YR 6/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.
- C1—6 to 14 inches; pale brown (10YR 6/3) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; soft, very friable, nonsticky and nonplastic; few fine and very fine roots many fine and very fine pores; strongly effervescent; moderately alkaline; gradual wavy boundary.

C2—14 to 60 inches; pale brown (10YR 6/3) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; many fine and very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Content of clay in the control section: 0 to 10 percent

A horizon

Hue: 10YR to 2.5Y
 Value: 5 or 6 dry, 3 or 4 moist
 Chroma: 2, 3, or 4
 Texture: Fine sand, loamy fine sand, or fine sandy loam
 Clay content: 0 to 10 percent
 Effervescence: none to strongly
 Reaction: pH 6.6 to 8.4

C1 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, loamy coarse sand, loamy fine sand, or coarse sand
 Clay content: 0 to 10 percent
 Rock fragments: 0 to 15 percent pebbles
 Effervescence: slightly or strongly
 Reaction: pH 7.4 to 8.4

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, loamy coarse sand, loamy fine sand, or coarse sand
 Clay content: 0 to 10 percent
 Rock fragments: 0 to 15 percent pebbles
 Effervescence: slightly, strongly, or violently
 Reaction: pH 7.4 to 8.4

93F—Yetull fine sandy loam, 15 to 45 percent slopes

Setting

Landform: Hills
Slope: 15 to 45 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Yetull and similar soils: 85 percent

Minor Components

Busby and similar soils: 0 to 4 percent
 Lambeth and similar soils: 0 to 3 percent
 Fleak and similar soils: 0 to 3 percent
 Tinsley and similar soils: 0 to 2 percent
 Slopes more than 45 percent: 0 to 2 percent
 Ponderosa pine (eastern part): 0 to 1 percent

Major Component Description

Surface layer texture: Fine sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

731F—Yetull-Dune land complex, 15 to 45 percent slopes

Setting

Landform:
 * Yetull—Sand dunes
 * Dune land—Sand dunes
Slope: 15 to 45 percent
Mean annual precipitation: 11 to 14 inches
Frost-free period: 105 to 125 days

Composition

Major Components

Yetull and similar soils: 50 percent
 Dune land: 40 percent

Minor Components

Lonesome and similar soils: 0 to 10 percent

Major Component Description

Yetull

Surface layer texture: Fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland

Flooding: None
Available water capacity: Mainly 3.6 inches

Dune land

Definition: Sand in ridges and intervening troughs that shift with the wind

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

73B—Yetull-Lonesome loamy fine sands, 0 to 6 percent slopes

Setting

Landform:

- * Yetull—Sand dunes
- * Lonesome—Stream terraces

Slope:

- * Yetull—0 to 6 percent
- * Lonesome—0 to 6 percent

Mean annual precipitation: 11 to 14 inches

Frost-free period: 105 to 125 days

Composition

Major Components

Yetull and similar soils: 45 percent
 Lonesome and similar soils: 40 percent

Minor Components

Lihen and similar soils: 0 to 10 percent
 Chinook and similar soils: 0 to 5 percent

Major Component Description

Yetull

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.6 inches

Lonesome

Surface layer texture: Loamy fine sand
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Eolian deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.5 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

Zahill Series

Depth class: Very deep (greater than 60 inches)

Drainage class: Well drained

Permeability: Slow (0.06 to 0.2 inch/hour)

Landform: Till plains, hills

Parent material: Glacial till

Slope range: 2 to 60 percent

Annual precipitation: 14 to 17 inches

Annual air temperature: 42 to 45 degrees F

Frost-free period: 100 to 120 days

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

Typical Pedon

Zahill clay loam, 25 to 60 percent slopes, in rangeland, 900 feet east and 1,100 feet north of the southwest corner of sec. 34, T. 23 N., R. 8 E.

A—0 to 3 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—3 to 18 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; common very fine tubular pores; few fine seams of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

C—18 to 60 inches; light yellowish brown (2.5Y 6/4) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; few fine roots; common very fine tubular pores; slightly effervescent; moderately alkaline.

Range in Characteristics

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

Ap horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Clay content: 27 to 35 percent
 Rock fragments: 0 to 35 percent—0 to 15 percent
 cobbles and stones, 0 to 20 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5, 6, or 7 dry; 4, 5, or 6 moist
 Chroma: 2, 3, or 4
 Texture: loam or clay loam
 Clay content: 20 to 35 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent
 stones or cobbles, 0 to 10 percent pebbles
 Calcium carbonate equivalent: 8 to 15 percent
 Effervescence: strongly or violently
 Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR, 2.5Y, or 5Y
 Value: 5 or 6 dry, 4 or 5 moist
 Chroma: 2, 3, or 4
 Texture: loam or clay loam
 Clay content: 20 to 35 percent
 Rock fragments: 0 to 15 percent—0 to 5 percent
 stones or cobbles, 0 to 10 percent pebbles
 Effervescence: slightly or strongly
 Gypsum content: 1 to 5 percent
 Reaction: pH 7.4 to 9.0

72F—Zahill clay loam, 25 to 60 percent slopes

Setting

Landform: Hills
Slope: 25 to 60 percent
Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Zahill and similar soils: 85 percent

Minor Components

Sunburst and similar soils: 0 to 5 percent
 Slopes less than 25 percent: 0 to 5 percent
 Cabba and similar soils: 0 to 2 percent
 Moderately deep, loamy soils: 0 to 2 percent
 Tinsley and similar soils: 0 to 1 percent

Major Component Description

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

723F—Zahill-Cabba complex, 15 to 45 percent slopes

Setting

Landform:
 * Zahill—Hills
 * Cabba—Hills
Position on landform:
 * Zahill—Backslopes and shoulders
 * Cabba—Backslopes and footslopes
Slope:
 * Zahill—15 to 45 percent
 * Cabba—15 to 45 percent
Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

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

Minor Components

Slopes more than 45 percent: 0 to 5 percent
 Amor and similar soils: 0 to 5 percent

Areas of rock outcrop: 0 to 3 percent
Shallow, sandy soils: 0 to 2 percent

Major Component Description

Zahill

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

Cabba

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

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

722F—Zahill-Sagedale-Wayden complex, 15 to 45 percent slopes

Setting

Landform:

- * Zahill—Hills
- * Sagedale—Hills
- * Wayden—Hills

Position on landform:

- * Zahill—Backslopes and shoulders
- * Sagedale—Footslopes
- * Wayden—Backslopes

Slope:

- * Zahill—15 to 45 percent
- * Sagedale—15 to 45 percent
- * Wayden—15 to 45 percent

Mean annual precipitation: 14 to 17 inches
Frost-free period: 100 to 120 days

Composition

Major Components

Zahill and similar soils: 40 percent
Sagedale and similar soils: 25 percent
Wayden and similar soils: 20 percent

Minor Components

Tally and similar soils: 0 to 8 percent
Moderately deep, clayey soils: 0 to 5 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Zahill

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

Sagedale

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.4 inches

Wayden

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.9 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

721E—Zahill-Vida clay loams, 8 to 25 percent slopes

Setting

Landform:

- * Zahill—Hills
- * Vida—Hills

Position on landform:

- * Zahill—Backslopes and shoulders
- * Vida—Footslopes

Slope:

- * Zahill—8 to 25 percent
- * Vida—8 to 15 percent

Mean annual precipitation: 14 to 17 inches

Frost-free period: 100 to 120 days

Composition

Major Components

Zahill and similar soils: 50 percent
Vida and similar soils: 40 percent

Minor Components

Bearpaw and similar soils: 0 to 3 percent
Slopes more than 25 percent: 0 to 3 percent
Moderately deep, loamy soils: 0 to 2 percent
Cabba and similar soils: 0 to 1 percent
Tinsley and similar soils: 0 to 1 percent

Major Component Description

Zahill

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Vida

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Till

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.6 inches

Management

For management information about this map unit see appropriate sections in Part II of this publication.

A typical soil description with range in characteristics is included, in alphabetical order, in this section.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. A body of alluvium, with overflow of water and debris flow deposits, whose surface forms a segment of a cone that radiates downslope from the point where the stream emerges from a narrow valley onto a less sloping surface. Source uplands range in relief and areal extent from mountains to gullied terrains on hill slopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillite. Weakly metamorphosed mudstone or shale.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in

inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
Low	3.75 to 5.0
Moderate	5.0 to 7.5
High	more than 7.5

Avalanche chute. The track or path formed by an avalanche.

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hill slopes. Back slopes in profile are commonly steep and linear and descend to a foot slope. In terms of gradational process, back slopes are erosional forms produced mainly by mass wasting and running water.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

- Bedrock-floored plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.
- Bench terrace.** A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.
- Blowout.** A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.
- Board foot.** A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.
- Bottom land.** The normal flood plain of a stream, subject to flooding.
- Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.
- Breaks.** The steep or very steep broken land at the border of an upland summit that is dissected by ravines.
- Breast height.** An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.
- Brush management.** Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.
- Cable yarding.** A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.
- Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.
- Caliche.** A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.
- California bearing ratio (CBR).** The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.
- Canopy.** The leafy crown of trees or shrubs. (See Crown.)
- Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.
- Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.
- Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.
- Catsteps.** Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.
- Channeled.** Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.
- Channery soil.** A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.
- Chemical treatment.** Control of unwanted vegetation by use of chemicals.
- Chiseling.** Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.
- Cirque.** A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.
- Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.
- Clayey soil.** Silty clay, sandy clay, or clay.
- Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

- Claypan.** A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.
- Clearcut.** A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.
- Climax plant community.** The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.
- Closed depression.** A low area completely surrounded by higher ground and having no natural outlet.
- Coarse textured soil.** Sand or loamy sand.
- Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.
- Cobbly soil material.** Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent cobbles, and extremely cobbly soil material is more than 60 percent cobbles.
- Codominant trees.** Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.
- Colluvium.** Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.
- Commercial forest.** Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.
- Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.
- Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.
- Compressible (in tables).** Excessive decrease in volume of soft soil under load.
- Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.
- Conglomerate.** A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.
- Conservation cropping system.** Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.
- Conservation tillage.** Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion; in areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.
- Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:
 Loose.—Noncoherent when dry or moist; does not hold together in a mass.
 Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
 Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
 Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a “wire” when rolled between thumb and forefinger.
 Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
 Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
 Soft.—When dry, breaks into powder or individual grains under very slight pressure.
 Cemented.—Hard; little affected by moistening.
- Consolidated sandstone.** Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very

hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water.

The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming).

Growing crops in strips that follow the contour.

Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of mean annual increment (CMAI).

The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called culmination of mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit the use of a full stripcropping pattern.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
 Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.
 Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.
 Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.
 Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low

hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

- Fallow.** Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.
- Fast intake** (in tables). The rapid movement of water into the soil.
- Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.
- Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.
- Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.
- Fine textured soil.** Sandy clay, silty clay, or clay.
- Firebreak.** An area cleared of flammable material to stop or help control creeping or running fires. A firebreak also serves as a line from which to work and to facilitate the movement of fire fighters and equipment. Designated roads also serve as firebreaks.
- First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.
- Flaggy soil material.** Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.
- Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.
- Flood plain.** A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is usually a constructional landform built of sediment deposited during overflow and lateral migration of the stream.
- Fluvial.** Of or pertaining to rivers; produced by river action, as a fluvial plain.
- Foothills.** A region of relatively low, rounded hills at the base of a mountain range.
- Foot slope.** The geomorphic component that forms the inner, gently inclined surface at the base of a hill slope. The surface profile is dominantly concave. In terms of gradational processes, a foot slope is a transition zone between an upslope site of erosion (back slope) and a downslope site of deposition (toe slope).
- Forb.** Any herbaceous plant not a grass or a sedge.
- Forest cover.** All trees and other woody plants (underbrush) covering the ground in a forest.
- Forest type.** A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.
- Fragile** (in tables). A soil that is easily damaged by use or disturbance.
- Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.
- Frost action** (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.
- Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.
- Giant ripple mark.** The undulating surface sculpture produced in noncoherent granular materials by currents of water and by the agitation of water in wave action during the draining of large glacial lakes, such as Glacial Lake Missoula.
- Glacial drift (geology).** Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.
- Glacial outwash (geology).** Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.
- Glacial till (geology).** Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.
- Glaciated uplands.** Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.
- Glaciofluvial deposits (geology).** Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. A gullied map unit is one that has numerous gullies.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the number 2 precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and

consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasesers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasesers commonly are the shorter plants and are less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

- Kame.** A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.
- Kame terrace.** A terracelike ridge consisting of stratified sand and gravel that were deposited by a meltwater stream flowing between a melting glacier and a higher valley wall or lateral moraine and that remained after the disappearance of the ice. It is commonly pitted with kettles and has an irregular ice-contact slope.
- Lacustrine deposit (geology).** Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.
- Lake plain.** A surface marking the floor of an extinct lake, filled in by well sorted, stratified sediments.
- Landslide.** The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.
- Large stones** (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.
- Lateral moraine.** A ridgelike moraine carried on and deposited at the side margin of a valley glacier. It is composed chiefly of rock fragments derived from the valley walls by glacial abrasion and plucking or by mass wasting.
- Leaching.** The removal of soluble material from soil or other material by percolating water.
- Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.
- Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.
- Loamy soil.** Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.
- Loess.** Fine grained material, dominantly of silt-sized particles, deposited by the wind.
- Low-residue crops.** Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.
- Low strength.** The soil is not strong enough to support loads.
- Marl.** An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.
- Mean annual increment (MAI).** The average annual increase in volume of a tree during the entire life of the tree.
- Mechanical treatment.** Use of mechanical equipment for seeding, brush management, and other management practices.
- Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.
- Merchantable trees.** Trees that are of sufficient size to be economically processed into wood products.
- Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.
- Microhigh.** An area that is 2 to 12 inches higher than the adjacent microlow.
- Microlow.** An area that is 2 to 12 inches lower than the adjacent microhigh.
- Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.
- Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.
- Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.
- Miscellaneous water.** A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.
- Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.
- Moderately deep soil.** A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.
- Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.
- Moraine.** An accumulation of glacial drift in a topographic landform of its own, resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.
- Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.
- Mottling, soil.** Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square

meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percolates slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipeline cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

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

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an

association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata mainly red in color and composed largely of sandstone and shale.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders.

Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline	8 to 16
Strongly saline	more than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to

increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder slope. The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the county.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $\text{Ca}^{++} + \text{Mg}^{++}$. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that is restrictive to roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

- Summit.** A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.
- Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."
- Tailwater.** The water directly downstream of a structure.
- Talus.** Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.
- Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.
- Terminal moraine.** A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive arcuate ridge or complex of ridges underlain by till and other types of drift.
- Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.
- Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.
- Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."
- Thin layer** (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.
- Till plain.** An extensive nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.
- Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.
- Toe slope.** The outermost inclined surface at the base of a hill. Toe slopes are commonly gentle and linear in profile.
- Too arid** (in tables). The soil is dry most of the time, and vegetation is difficult to establish.
- Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.
- Toxicity** (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.
- Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.
- Trafficability.** The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.
- Tread.** The relatively flat terrace surface that was cut or built by stream or wave action.
- Tuff.** A compacted deposit that is 50 percent or more volcanic ash and dust.
- Understory.** Any plants in a forest community that grow to a height of less than 5 feet.
- Unstable fill** (in tables). Risk of caving or sloughing on banks of fill material.
- Upland** (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.
- Valley.** An elongated depression area primarily developed by stream action.
- Valley fill.** In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.
- Variation.** Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.
- Varve.** A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near

the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

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