



United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Montana Agricultural
Experiment Station

Soil Survey of Rosebud County Area and Part of Big Horn County, Montana Part I



How To Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, 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.

On the **general soil map**, which is the color map preceding the detailed soil maps, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your general area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** follow the general soil map. These 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 data base consists of a soils map at a scale of 1 to 250,000 and descriptions of groups of associated soils. It replaces the general soil map published in older soil surveys. The map and the data base can be used for multicounty planning, and map output can be tailored for a specific use. More information about the State Soil Geographic Data Base for this survey area, or for any portion of Montana, is available at the local office of the Natural Resources Conservation Service.

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

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1985. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Natural Resources Conservation Service and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Rosebud Conservation District, the Lower Musselshell Conservation District, the Big Horn Conservation District, and the United States Department of the Interior, Bureau of Indian Affairs. Financial assistance was provided by the United States Department of the Interior, Bureau of Land Management and the Bureau of Indian Affairs, and the Rosebud County Commissioners.

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: A typical area of Delpoint-Cabbart-Yamac loams, 8 to 25 percent slopes, used for grazing.

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Foreword

This soil survey contains information that can be used in land-planning programs in the survey area. 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. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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Soil Survey of Rosebud County Area and Part of Big Horn County, Montana

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United States Department of Agriculture, Natural Resources Conservation Service,
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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

This soil survey updates the "Soil Survey of the Middle Yellowstone Valley Area, Montana," published in 1940. It provides additional information and has larger maps, which show the soils in greater detail.

The survey area is in southeastern Montana (fig. 1). It includes all of Rosebud County except a part in the Custer National Forest. It also includes the part of Big Horn County in the Northern Cheyenne Indian Reservation. The survey area covers 3,316,600 acres, or about 5,182 square miles. About 444,524 of these acres are in the Northern Cheyenne Indian Reservation.

Figure 1.—Location of the survey area in Montana.

The survey area is bounded by Garfield County on the north; Custer County, Powder River County, and Custer National Forest on the east; Big Horn County and Treasure County on the south and west; and Musselshell County and Petroleum County on the west. A small area also is bounded by Yellowstone County southwest of Sumatra.

Forsyth is the county seat in Rosebud County. It is located along the Yellowstone River, about 100 miles east of Billings and 43 miles west of Miles City.

Ranching is the main agricultural enterprise in the survey area. Only about 6 percent of the area is used as cropland. Coal mining and oil production are also important industries.

Elevation in the survey area is 2,400 to 4,800 feet. The mean annual precipitation is 10 to 19 inches, and the mean annual temperature is 38 to 46 degrees F. The frost-free period is 90 to 135 days.

Several fairly large tracts of land in the survey area were not mapped. The landowners refused to permit soil scientists access to the land. The areas are in T. 6 N., R. 40 and 41 E.; T. 5 N., R. 40 and 41 E.; T. 4 N., R. 40, 41, and 42 E.; T. 3 N., R. 40, 41, and 42 E.; T. 1 N., R. 39 and 41 E.; T. 1 S., R. 39, 40, 41, and 42 E.; and T. 2 S., R. 39, 40, and 41 E. They have been identified on the soil maps with the letters "DA" or with the words "denied access."

History and Development

In 1804, the Northwest Company organized an expedition to "undertake a journey of discovery to the Rocky Mountains." The expedition entered the survey area about July 15, 1805. Captain Clark, of the Lewis and Clark Expedition, traveled down the Yellowstone River in 1806. In 1835, the American Fur Company

established Fort Van Buren at the mouth of Rosebud Creek. In 1850, it established Fort Sarpy on the north side of the Yellowstone River below the mouth of Rosebud Creek. A few fur traders and trappers were in the area until about 1870.

In the early 1880's, cattlemen began bringing in herds of cattle from Texas. Herds of sheep also were moved in from Utah. The next 30 years were known as the "day of the open range." No fences were used, and cattle owned by various people mingled and grazed freely across the area. The sheep grazed mainly north of the Yellowstone River. The towns of Vananda, Ingomar, and Sumatra were the main centers for the sheep industry.

From 1909 to 1917, the rainfall was above normal levels in the area and grain prices were high. As a result, much of the tillable land was used for homesteads during this period. From 1917 to 1940, the rainfall was below normal levels and grain prices were low. Many of the homesteaders went bankrupt and abandoned their fields to move away from the area. In many places erosion was severe.

The Northern Pacific Railroad was built in 1882. As a result, the towns of Forsyth and Rosebud were established. The Chicago, Milwaukee, St. Paul, and Pacific Railway, which was commonly called The Milwaukee Road, was built in 1910.

Strip-mining for coal began in Colstrip in 1924, and a branch railroad was built from Forsyth to Colstrip. In 1957, the Northern Pacific Railroad converted to the use of diesel locomotives and the mines closed. In 1969, the Western Energy Company, a subsidiary of Montana Power Company, reopened the mines. Oil was discovered along the Sumatra anticline in about 1950.

The Rosebud Conservation District was originally formed in 1942 and was called the Carterville-Thurlow Soil Conservation District. The district presently includes all of Rosebud County, except for about 43,000 acres along the Musselshell River. This acreage is in the Lower Musselshell River Conservation District. A part of the Northern Cheyenne Indian Reservation is in Big Horn County and is in the Big Horn Conservation District.

Natural Resources

Soil is the most important natural resource in this agriculturally based area. The livestock industry is the main agricultural enterprise. More than 90 percent of the survey area is used for grazing. About 25,000 acres is used for tame pasture, which consist mainly of crested wheatgrass. Approximately 6 percent of the area, or about 200,000 acres, is used as cropland. About 170,000 acres is used for dryland crops,

and 30,000 acres is used for irrigated crops.

About 225,000 acres of ponderosa pine woodland is in the survey area. Most of this acreage is used for grazing and has limited value as commercial forest, although significant areas of woodland on the Northern Cheyenne Indian Reservation and in the Little Wolf Mountains are harvested for commercial forest products. Plains cottonwood is also a source of commercial lumber along the Yellowstone River. Sawmills are at Ashland and Lame Deer for ponderosa pine and at Rosebud for cottonwood.

Coal resources are extensive in the survey area. There is an estimated 12 billion tons of strippable coal in Rosebud County (fig. 2). Deposits are mainly in the Tongue River Member of the Fort Union Formation in the southern part of the survey area. Most of the coal presently mined in the Colstrip area is hauled by trains to markets in the upper Midwest. Some coal is used for the four coal-fired, electrical power generating plants located near Colstrip.

Five oil fields in an area around Sumatra produce a total of about two million barrels each year.

Bentonite is in the Bearpaw Shale Formation in the north-central and northwestern parts of Rosebud County, but extensive mining operations have not been developed. Bentonite was once strip-mined in the Vananda area.

The edges of stream terraces along the Yellowstone River are a significant source of sand and gravel. A concrete plant is near Forsyth. Baked sandstone and shale, locally known as "red scoria," are mined for use on county roads in the southern part of the survey area. The material disintegrates into fine particles after several years of service as a road surface. The scoria are also referred to as clinker beds. They were caused by burning of thick seams of coal.

Agate is in the Yellowstone River and in adjacent gravelly stream terrace deposits. Some people spend many hours searching for this semiprecious gemstone.

Wildlife is an important resource in the survey area. Hunting deer, antelope, and waterfowl is a major seasonal recreational activity. Fishing is popular on the Yellowstone River.

Industry, Markets, and Transportation Facilities

Livestock production, coal mining, coal-fired generation of electricity, and crude oil production are the principal industries in the survey area.

Public stockyards provide ranchers with a good facility to use in marketing livestock. Feeder buyers purchase some livestock directly off the ranch.

Forsyth serves as a distribution center for firms that



Figure 2.—Strip-mining for coal in an area of Chinook fine sandy loam, 2 to 8 percent slopes.

sell farm machinery, automobiles, and trucks and for the service industries that are connected with these firms.

The Burlington Northern Railroad services Forsyth. A branch line runs from west of Forsyth to the coal mines near Colstrip.

The area is well served by paved highways. Interstate 94 connects Forsyth with Miles City to the east and with Billings to the west. U.S. Highway 12 connects the towns of Forsyth and Roundup and runs

through Vananda, Ingomar, and Sumatra. Montana Highway 39 connects Colstrip with Interstate 94 and Lame Deer. U.S. Highway 212 connects the towns of Ashland, Busby, and Lame Deer with Broadus to the east and with Interstate 90 to the west. Forsyth is also served by a county airport located about 3 miles east of the town.

Passenger bus and freight service is also available in towns along Interstate 94. Several motor freight lines serve the area.

Physiography, Drainage, and Geology

The survey area is in the Missouri Plateau section of the Northern Great Plains province. The surface does not resemble a plain, however, as some parts are rough and dissected and the area contains very pronounced features of relief. The Little Wolf Mountains, which extend into the southwestern part of the survey area, form the most pronounced topographic feature. These mountains rise 800 to 1,000 feet above the adjoining plains and consist of relatively flat beds of the Fort Union Formation. The uplands in the Northern Cheyenne Indian Reservation in the southern part of the survey area, are thick, nearly flat sedimentary beds of the Fort Union Formation. They have been deeply dissected by the Tongue River and its tributaries.

In the north-central part of Rosebud County, the broad, rolling uplands between Big and Little Porcupine Creeks are known as "Porcupine Dome." The dome does not have a striking expression of the surface topography, but the underground structure is dome shaped. Bedrock dips away from the center of the geologic structure. The area is mostly a treeless plain. The valleys of the two creeks to the west and east of the dome are broad. The slope to the uplands is very gentle because of the soft bedrock, which is mainly shale. The valley of Big Porcupine Creek is particularly broad for the size of the stream that flows through it. It has a complex history. The valley is thought to be an old channel of the Musselshell River. The dome is about 30 miles long and 25 miles wide. Its structure is complicated by minor faults that trend in an easterly direction. The strata in the central portion of the dome are nearly horizontal, but the incline is 3 to 8 degrees on the eastern and southern margins. On the north and west margins of the dome, the bedrock is inclined 1 to 3 degrees. Dikes of igneous rock are in the west-central portion of the area. Where the bedrock is moderately inclined, broad surface expanses of uniform materials exist. In areas where the incline is greater, the surface exposures are smaller.

The most prominent feature of Porcupine Dome is the steep escarpment along the west side of the Big Porcupine Valley. Portions of this escarpment can be seen on all sides of the dome.

Most of the survey area is drained by the Yellowstone River and its tributaries. The Yellowstone River flows to the east through the center of Rosebud County. It is the largest drainageway in the region. The principal tributaries from the north are Big Porcupine, Little Porcupine, Horse, South Sunday, and North Sunday Creeks. South of the Yellowstone River, Armells and Rosebud Creeks are the largest. Other tributaries include Hay, Reservation, Slaughterhouse,

Sweeney, Cache, Iron Jaw, and Graveyard Creeks. The minor drainageways are intermittent. The Tongue River, which flows across the southeast corner of Rosebud County and enters the Yellowstone River at Miles City, has many tributaries. The largest of these include Otter, Odell, Cook, and Hanging Women Creeks.

The northwestern portion of Rosebud County is drained by the Musselshell River and its major tributary, Rattlesnake Creek. This system drains to the north and enters the Missouri River just upstream from the Fort Peck Reservoir.

The altitude in the central and southern parts of the area ranges from about 2,400 feet above sea level on the Yellowstone River at the eastern boundary of the county to about 4,800 feet at the top of the Little Wolf Mountains. The maximum relief is about 2,400 feet. The summit of the divide between the Tongue River and Lame Deer Creek, a tributary of Rosebud Creek, is about 4,300 feet above sea level.

The maximum elevation in the northern portion of the area is 3,725 feet in an area southwest of Sumatra. The maximum relief in Rosebud County north of the Yellowstone River is about 1,400 feet.

Generally, the streams are bordered by belts of wide alluvial benches separated by low bedrock bluffs that are gently sloping to steep and are several hundred feet high. These topographic features are expressions of the differences in type of rock structure and their resistance to erosion.

Areas of badland occur as bare, steep slopes in Rosebud County. The area between Little Porcupine Creek and South Sunday Creek contains significant areas of badland in Lebo shale. Badland also occurs in Lebo shale along Rosebud Creek. In the southern part of the survey area, coal has burned along many of the surface outcrops, producing a rugged topography broken up by large areas of red clinker beds.

The survey area has not been subject to the physiographic changes characteristic of other portions of Montana. It has not been glaciated, and it has not been subjected to great earth uplifts as have regions not far to the west and north. With the exception of the Musselshell River, the major drainageways flow along approximately the same courses that they have always followed. Although the valleys have been repeatedly deepened, the condition of drastic drainage modifications, which in northern Montana reversed the direction of flow of several large rivers, has not occurred.

The survey area may be described as an upland plain trenched by numerous drainageways. The area is rolling, and creek valleys are deeply incised. Outcrops of hard, resistant rock form isolated buttes and mesas. In localized areas, the uplands are rugged because of

differential erosion of hard and soft strata. Soils in the uplands are shallow to very deep. In areas where streams have not cut deeply into the surface, some dryland farming is practiced. In areas where the land is more rugged, it is used for grazing.

The major river valleys are 1 to 2 miles wide and are nearly level. Most of the irrigated farming is practiced along these stream valleys. The soils are sandy to clayey alluvium. They are very productive. The flat valleys are separated from the uplands by steep, irregular slopes.

Although the streams in the area flow along their original courses, the upland surfaces indicate that a long period of downcutting has occurred. The streams have successively lowered their base level. The plateau-like, upland surfaces and the river gravel that caps some of the upland areas provide evidence of this old erosional cycle. The deposits of gravel occur at different levels, which indicates stage downcutting. Along the Yellowstone River, the gravel occurs 150 to 400 feet above the valley. In Rosebud County, four or five successive stream terraces are visible. The uppermost of the highland gravels are 20 to 30 million years old and are from the Miocene or Oligocene epoch. The benches somewhat lower on the landscape are early Pliocene in age. The stream terraces near the river are from the early Pleistocene. The valley flats formed during and after the retreat of glacial ice from northern Montana. The streams are presently in a new cycle of downcutting.

The present land surface in the survey area reflects long periods of sedimentation and erosion. Many stratigraphic units are exposed at the surface. The fluctuating level of the seas that covered much of Montana hundreds of millions of years ago caused alternating deposits of sand, silt, clay, and lime. Over time, these deposits were compacted, cemented, and hardened and eventually became sandstone, siltstone, and shale.

The sediments were nearly horizontal when they were deposited. During the late Eocene, about 30 million years ago, they became tilted, folded, and faulted. The deformation occurred after the deposition of the highest beds of the Tongue River and before the development of the Flaxville Plain.

The geologic structure in the central and southern part of the survey area, south of the Yellowstone River, is comparatively simple. The strata are so well exposed that determining the structural features, which consist of gentle folds and a few faults of slight displacement, is not difficult.

Extending across the southern part is a broad, northeast-pitching syncline that follows the Tongue River Valley. The beds dip toward the axis of the

syncline at angles of less than one percent. The syncline belongs to the Powder River structural basin. A northwest-trending downfold crosses the Powder River basin syncline near Ashland. The syncline is the major structural feature that separates the Big Horn uplift on the south from Porcupine Dome on the north.

A number of small northwest-trending faults occur in the southern part of the survey area. The maximum displacement is approximately 75 feet. A typical fault is in sec. 25, T. 1 N., R. 43 E. This area is capped by a coal and clinker bed. North of the fault, the beds have been displaced downward about 45 feet more than the beds in the south.

Although Porcupine Dome in the north-central part of Rosebud County is the most pronounced structural feature, two other domes are in Rosebud County. The Ingomar Dome is about 3 miles southeast of Ingomar. No producing oil wells are on this dome. The Sumatra Dome is about 10 miles northwest of Sumatra. Producing oil wells are on and around this dome. Several oil wells are also located about 3 miles south of Sumatra. Some oil wells are in a southwest extension of Alice Dome in sec. 35, T. 13 N., R. 33 E. Several minor folds are closely related to Porcupine Dome. The most obvious fold is located 2 miles west of Vananda. Its east and west dips are less than 2 degrees. In sec. 28 and 33, T. 7 N., R. 39 E., Big Porcupine Creek cuts across another fold, which strikes west 23 degrees east. This fold is called the Antwerp anticline.

The rocks have been faulted at several places on the south and west flanks of Porcupine Dome. The maximum displacement is about 50 feet.

After rock deformation, four gravel-covered erosional surfaces developed in eastern Montana and in adjacent parts of Canada. The highest surface and, therefore, the oldest surface is the Cypress Plain. The gravel on this surface contains vertebrate fossil remains from the Oligocene epoch. The gravel associated with the Cypress Plain is in T. 3 and 4 N., R. 39 E., and in the northeastern part of T. 4 N., R. 40 E. and R. 41 E.

Below the Cypress Plain is the Flaxville Plain, which contains Miocene or early Pliocene mammalian remains. Stream terraces that have been assigned to the Flaxville Plain are in central and southern Rosebud County. The terraces are along the Yellowstone River and are east and southeast of Rosebud Buttes in T. 5 N., R. 43 E.

Well developed stream terraces that are younger than the Flaxville Plain are along the Yellowstone Valley at an elevation of about 150 to 350 feet above that of the river. These terraces were developed during the Late Pliocene and early Pleistocene epochs. The best preserved terrace forms a high bench on both sides of the river in T. 6 N., R. 40 E.; T. 6 N. and T. 7 N., R. 39

E.; T. 6 N., R. 44 E.; and Forsyth Flats in the northern part of T. 6 N., R. 41 E. The stream terraces are about 200 feet above the river. Few of these gravel surfaces are north of the southern part of T. 7 N., but the gravels are as far south as T. 3 N., R. 39 E.

Erosion also resulted in development of the lowest stream terraces along the Yellowstone River. The river has since incised into the valley to a depth of less than 30 feet.

Rock exposed in the survey area is of sedimentary origin and ranges in age from Upper Cretaceous to recent.

The Colorado Formation from the Upper Cretaceous period is the oldest geologic section that crops out in the survey area. It is overlain by a shaly section of the Eagle Sandstone and by the Claggett Shale, the Judith River Sandstone, and the Bearpaw Shale.

The Colorado Formation, the Claggett Shale, and the Bearpaw Shale are composed dominantly of shale that has thin lenses of sandstone. The Judith River Sandstone has thick zones of sandstone separated by siltstone and shale.

The marine Bearpaw Shale is overlain by the Fox Hills Sandstone from the Upper Cretaceous period and about 900 feet of nonmarine shale and sandstone of the Lance Formation. The youngest bedrock formation exposed in the survey area, from the Tertiary period, is the Fort Union Formation, which is as much as 2,000 feet thick. The Fort Union Formation consists of layers of dark shale and alternating thick beds of white to yellow sandy clay siltstone and sandstone. The upper part of the Fort Union Formation contains numerous coal beds. Clinker beds are found along surface outcrops.

Surficial deposits, ranging from Oligocene to recent in age, form a thin mantle over the eroded surface of the bedrock. These deposits include residual loess, terrace gravel, and alluvial fill along present streams.

The following paragraphs describe the various geologic systems and the formations that resulted from the action of these systems. The textures described in this section are engineering terms used in the Unified soil classification system (2).

Upper Cretaceous System (60 million years)

Colorado Shale.—The Colorado Shale is exposed in northern Rosebud County in the top part of the Porcupine Dome, mainly in T. 10 and 11 N., R. 38, 39, and 40 E. East Blacktail Creek flows along the western edge of the outcrop. The Colorado Shale is approximately 2,200 feet thick. It is dominantly dark gray or black fissile shale that has thin bands of sandy shale, limestone, and fossiliferous, calcareous concretionary beds. The sediments are marine in origin.

Crystals of calcite are common, and vegetation is sparse. The shale is erosive and is plastic and sticky when wet. The soils are clayey textured and are commonly called "gumbo."

The Colorado Shale in Rosebud County has inclusions of bentonite and has iron-sulfur compounds in the shale. These materials tend to be acidic, and soils in the Colorado Shale are very strongly acid as a result.

Soils that formed in sediment from the Colorado Shale include Louscot, Neldore, Orinoco, Vaeda, Volborg, Yawdim, and Zatoville soils. The Colorado Shale is not a ground-water aquifer in the survey area.

Eagle Formation.—The Eagle Formation is exposed along the flank of the Porcupine Dome. Big Porcupine Creek flows along the western edge of the outcrop. In T. 9 N., R. 37 E., West Blacktail Creek flows into Big Porcupine Creek. From this point, the Eagle Formation can be traced in an easterly direction for 18 miles in T. 9 N., R. 37, 38, 39, and 40 E. In Rosebud County, the Eagle Formation is marine in character. It is not composed of the massive, cliff-forming sandstone that is common in areas west of Rosebud County. The pinching out of the Eagle sandstone is a result of a deeper sea invasion in Rosebud County. In this area the Eagle Formation consists of yellowish gray to olive gray, fine grained, soft, shaly sandstone and sandy shale. It also has a few medium limestone concretions that are light brownish gray and contain shell fragments. Near the area when the Colorado Shale and the Eagle Formation meet, several thin but conspicuous beds of gray, calcareous ironstone concretions visually identify sediments from the Eagle Formation. The transition between the Eagle Formation and the underlying Colorado Shale is gradational.

Soils in a fine-silty family, such as Davidell, Ivanell, and Sumatra soils, formed in materials derived from the Eagle Formation. Because it has a fine texture, the Eagle Formation is not a good ground-water aquifer in the survey area. It can produce small amounts of mineralized water.

Claggett Shale.—The Claggett Shale is along the flanks of Porcupine Dome, downslope from the Eagle Formation outcrop. The Claggett Shale outcrop can be traced in a circular area around the dome. Big Porcupine Creek flows through most of the length of the Claggett Shale outcrop. The Claggett Shale is mostly shale that is somewhat sandy near the contact with the overlying sands of the Judith River Formation. The shale is easily erodible, and the areas of outcrop form a somewhat desolate landscape. Stream drainageways are choked with sediment that has eroded from the Claggett Shale. Soils that formed in the Claggett Shale

include Neldore and Volborg soils. The Claggett Shale is not a ground-water aquifer in this area.

Judith River Formation.—The Judith River Formation is along the lower flanks of Porcupine Dome. The areas of outcrop average 2 miles in width and extend in a circular pattern around the dome. The Judith River Formation is formed by three distinctive units—an upper and a lower member of sandstone and a middle member of shale. The formation is about 450 feet thick, and the middle shale member is 200 feet thick. Thick sections of the lower member of sandstone are located near the base of the formation. Most of the geologic section can be observed in a high bluff southeast of Vananda in sec. 16, T. 7 N., R. 38 E. The upper member of sandstone is thinly bedded. On the south and east sides of the dome, it forms well developed hogbacks. The shale member is a dark brown shale that is very similar to the Claggett Shale. This shale zone contains numerous fossiliferous, calcareous concretionary beds.

Soils that formed in the sandstone members include Blackhall, Busby, Cabbart, Delpoint, Galbreth, and Twilight soils. Soils that formed from the shale member include Neldore soils.

The sandstone members of the Judith River Formation are used for the development of ground-water wells. The water is mineralized but is considered suitable for use by livestock.

Bearpaw Shale.—The Bearpaw Shale is in the northwest portion of Rosebud County. The areas of outcrop extend 6 to 7 miles south of the Yellowstone River. They are also to the north and east of Porcupine Dome. The shale is as much as 900 feet thick in some areas. It is dark gray and contains brown, calcareous concretionary bands that have an abundance of marine invertebrate fossils. The shale is erosive and forms a subdued, undulating topography. The transition between the Bearpaw Shale and the overlying sandstone is gradational. Soils that formed in material derived from the Bearpaw Shale are Abor, Gerdrum, Neldore, Marvan, and Vaeda soils. The Bearpaw Shale is not a ground-water aquifer.

Lance Formation.—Toward the end of the Cretaceous period, vertically acting forces in the earth caused the uplift of the ancestral Rocky Mountains. Before the second phase of mountain building, during the middle of the Tertiary period, these ancestral mountains were subjected to erosional forces that persisted until the surface was again a flat, truncated plain. Erosional materials from this period were spread for hundreds of miles over eastern Montana, which resulted in the Lance Formation and the Fort Union Formation of the early Tertiary period.

The Fox Hills Member of the Lance Formation crops

out in Rosebud County in a large area east of Little Porcupine Creek and south of the Yellowstone River. Typical outcrops are in T. 6 N., R. 39 and 40 E., and in T. 9, 10, and 11 N., R. 41 E. The Fox Hills Member is composed of two parts. The lower part is of marine origin and is composed mainly of thin beds of grayish yellow, sandy shale. The upper part is made up of massive, arkosic sandstone beds that are commonly crossbedded. Irregular concretions of harder sandstone as large as 5 feet in diameter are common in the upper part of the member.

The nonmarine origin of the upper part is indicated by the remains of dinosaurs and other nonmarine vertebrates and by bed plants. Blackhall, Busby, Cabbart, Delpoint, and Twilight soils formed in material derived from the Fox Hills Member. The Fox Hills sandstone is an excellent ground-water aquifer. The water is soft, and wells yield as much as 90 gallons per minute.

The Hell Creek Member of the Lance Formation consists of amber-colored shale, thin interbedded sandstone, siltstone, thin coal seams, and conglomerate beds that represent old channel deposits. The conglomerate is generally interbedded with sandstone and can be as much as 50 feet thick. The gravel and cobbles, which are fairly well rounded, consist of sandstone in a matrix of sand. An exposure of the conglomerate is visible in the SW $\frac{1}{4}$ sec. 31, T. 8 N., R. 41 E.

The Hell Creek Member crops out on both sides of the Yellowstone River from the mouth of Armells Creek east to Rosebud. A band about 5 miles wide extends north from Forsyth to the head of South Sunday Creek near the Garfield County Line. Cabbart, Cambeth, Delpoint, Gerdrum, Lonna, Yamac, and Yawdim soils formed in material derived from this member. Interbedded with sediments from the Hell Creek Member are beds of coal, which indicate the repeated presence of swamps on the coastal plains. Large dinosaurs, including Triceratops, roamed the flood plains along the river, and their skeletons commonly are discovered in the buried rock of the Hell Creek Member. Beds of bentonite up to 3 feet thick are in many areas of shale. Volcanic ash was deposited in the marine seas and was chemically altered to form bentonite. Sandstone beds and coal beds in the Hell Creek Member are good aquifers, and wells that have a small diameter can yield a quality and volume of water adequate for domestic and livestock use.

The Tullock Member is the upper part of the Lance Formation. It consists of yellowish gray to buff sandstone and shale. Unlike the underlying Hell Creek Member, it contains a number of thin, noncommercial coal beds. Calcareous bands of shale are also present.

At the upper part of the Tullock Member, a thin layer of sandstone is present. It occurs throughout the region, and it forms a well developed, flat-topped escarpment. Below the escarpment are steep cliffs of the Tullock Member. In Big Horn County, west of the survey area, the Tullock Member consists of a thick layer of sandstone that forms cliffs 30 to 40 feet high. In the central part of Rosebud County, the cliffs are generally less than 10 feet high. An example is in sec. 18, T. 3 N., R. 42 E. Along the east side of Rosebud County, the Tullock Member is less than 5 feet thick. An example is in sec. 3, T. 7 N., R. 43 E. The underlying beds from the Hell Creek Member are generally eroded into a topography similar to badland, so that the outcrop surface of the Tullock Member is extremely rough and rugged.

The sandstone rim is overlain by the Lebo Shale Member, which crops out in gentle slopes slightly behind the Tullock escarpment, producing a striking physiographic contrast. Outcrops that are typical of the Tullock Member are visible along the upper drainageways of Armells, Smith, and Slaughterhouse Creeks. Soils that formed in the Tullock Member include Bonfri and Cabbart soils.

Tertiary System (40 to 50 million years)

Fort Union Formation.—The Fort Union Formation of the Eocene epoch crops out in the eastern and southern parts of the survey area. It contains numerous coal beds that have commercial value. The Fort Union Formation, which is more than 1,800 feet thick, is composed of a basal shale zone called the Lebo Shale Member and a thick upper zone called the Tongue River Member. The shale zone is approximately 170 feet thick in Rosebud County.

The Lebo Shale Member of the Fort Union Formation consists of dark gray to black clay and shale. The color of the member and the predominance of clay that it contains distinguish it from the mostly yellow and red overlying Tongue River Member. The Lebo Shale Member crops out and forms a broad belt south of the Yellowstone River. It extends in a northeasterly direction across Rosebud County from T. 3 N., R. 39 E., across the upper drainageways of Armells Creek, Rosebud Creek, and Sweeney Creek to the county line in T. 6 N., R. 44 E. The Lebo Shale Member crops out along the drainageway of Sunday Creek and its tributary drainageways north of the Yellowstone River. At the bottom of the Lebo Shale Member is a distinctive marker called the Big Dirty bed, which lies directly on the sandstone rimrock at the top of the Tullock Member. Coal in the Big Dirty bed is of workable thickness and quality along the boundary between T. 3 N., R. 40 E., and T. 3 N., R. 41 E., and along the east and west

forks of Armells Creek. Thin layers of coal associated with beds of carbonaceous shale also occur in the Lebo Shale Member in Rosebud County. These beds, however, have no commercial value. The most distinguishing characteristics of the Lebo Shale Member include the dark color, the barren surface, and the ironstone concretions. The Lebo Shale Member weathers to badland that has some low, flat-topped buttes.

Cabbart, Delpoint, Gerdrum, Rominell, and Weingart soils are examples of soils that formed in material derived from the Lebo Shale Member of the Fort Union Formation.

The Tongue River Member is the upper part of the Fort Union Formation. It is light in color and contrasts sharply with the Lebo Shale Member. It contains the youngest bedrock strata that crop out in the survey area. The member is composed of shale, sandstone, sandy silt, and coal. About 1,650 feet of these beds are exposed in the southern part of Rosebud County. The Tongue River Member is the most productive coal-bearing geologic section in Montana.

The most distinguishing characteristic of the Tongue River Member is the bright red scoria, or clinker beds. This unusual type of rock has developed locally where thick seams of coal have burned. The burning caused baking and reddening of the overlying material. In some places, the heat from burning coal was so intensive that it fused shale into liquid slag. The clinker beds are along surface outcrops of thick seams of coal. The red clinker deposits generally do not extend far underground, but in upland areas where the overburden was not thick, the deposits are up to 100 feet thick. Because the clinker beds resist erosion, they commonly stand out in sharp relief and tend to develop semirugged topography. Soils that formed in the clinker beds include Armells, Birney, Bitton, Coopers, Kirby, Lamedeer, Ringling, Spang, and Twin Creek soils.

The sandstone of the Tongue River Member is massive and blocky. The outcrops are light gray to light tan and may occur as cavern-faced cliffs that are 50 to 75 feet high and have many large knobs and sharp pinnacles. The sandstone is composed primarily of subangular quartz but also has many grains of silicate minerals, such as mica and feldspar. In some areas, the sandstone contains flakes of gypsum. The cementing materials are calcium carbonate and clay. Concretions, many of which are pyrite and marcasite, are common in the sandstone. These concretions weather to brown limonite.

The sandstone of the Tongue River Member is a good ground-water aquifer. Wells commonly yield 6 to 15 gallons per minute. Soils that formed in the sandstone of the Tongue River Member include

Blackhall, Busby, Chinook, Twilight, and Yetull soils.

Extensive areas of the Tongue River Member are composed of interbedded sandstone, siltstone, and shale. Soils that formed in the upper silty part, at the higher elevations on the Northern Cheyenne Indian Reservation, include Bryant, Cabba, Doney, Sagedale, and Shambo soils. Other soils in the Tongue River Member include Busby, Cabbart, Cambeth, Delpoint, Lonna, Kobar, and Yawdim soils.

Oligocene or Miocene Terrace Gravel (20 to 30 million years)

Gravel deposits associated with the Cypress Plain form a geomorphic surface cap, or plateau, on the divide between Armells and Sarpey Creeks and the tops of the highest hills and ridges in the northern part of T. 4 N., R. 41 E. These deposits are 1,050 to 1,100 feet above the Yellowstone River and have a maximum thickness of 60 feet. The lower portion of the gravel is cemented into a conglomerate. The deposits contain boulders that are a foot or more thick, and they are composed of igneous rock ranging in composition from granite to basalt. They also contain agate, silicified wood, and fragments of coal clinker. The clinker indicates that some of the coal was burned before the gravel was deposited. Tinsley soils formed in these deposits.

Miocene or Pliocene Terrace Gravel (10 to 20 million years)

Terrace benches 350 to 1,000 feet above the Yellowstone River are thought to be an extension of the Flaxville geomorphic surface. The terraces are composed of gravel, which ranges from 10 to 100 feet thick. The gravel is composed of well rounded quartzite and argillite pebbles and a matrix of sand, clay, and volcanic ash. The terraces are along the Yellowstone River and east and southeast of Rosebud Buttes in T. 5 N., R. 43 E. Armells, Birney, and Tinsley soils formed in these gravel deposits.

Pleistocene Terrace (1 to 5 million years)

Along the Yellowstone River, at an altitude of 150 to 350 feet above the river, are extensive, well developed terraces that are younger than those of the Miocene or Pliocene epochs. The best preserved of these terraces are about 200 feet above the river. They form the bench on both sides of the river in T. 6 N., R. 40 E., and form the Forsyth Flats in the northern part of T. 6 N., R. 41 E. The maximum thickness of the Pleistocene gravel is about 75 feet. In several areas the gravel has been cemented by carbonate and iron oxide to form a hard conglomerate. In areas where the terraces have not been eroded, they are covered with several inches to

several feet of loamy material. The deposits extend only a mile or two north of the river to the southern part of T. 7 N. They extend 25 to 28 miles south of the river to T. 3 N. Soils that developed in these deposits include Armells, Evanston, Floweree, Kremlin, Tinsley, and Vanstel soils.

Recent Alluvium

Alluvial deposits are along the valleys of the major river systems and along small streams and their tributaries. Most of the alluvium consists of clay, fine silt, and sand that is underlain by gravel. The character of the alluvium is largely dependent upon the type of material to which the stream has access. In areas of outcrops of the Lebo, Bearpaw, Claggett, and Colorado Shales, the alluvium is dominantly silt and clay that have a small amount of sand and generally have no gravel. The alluvium along the Yellowstone River contains extensive gravel deposits that are overlain by silty clay, silt, and sand. The source of the alluvium is the high terrace benches adjacent to the Yellowstone drainageway. In the southern part of the survey area, soils formed in sediments of the Tongue River Member. The gravel lenses interbedded with silt consist almost entirely of angular fragments of red clinker, sandstone, and shale fragments. Among the soils that formed in recent alluvial deposits are Glendive, Hanly, Harlem, Havre, Kobar, Spinekop, and Yamac soils.

Ground-Water Resources

Water for domestic and livestock use in the survey area is mostly obtained from wells. The wells range from shallow wells that are dug along the creek valleys to deep, drilled wells in the upland areas. They range from 15 to 2,500 feet in depth. The deep wells are highly mineralized. The towns of Forsyth, Rosebud, Colstrip, Ashland, and Birney obtain most of their domestic water supply from wells. The Yellowstone and Tongue Rivers offer an abundant supply of water for irrigation.

Ground water in the area is in a variety of alluvial aquifers and in terrace deposits of sand, gravel, and bedrock formations of sandstone; coal; fissile, sandy shale; and baked clinker beds. The Colorado Shale, Claggett Shale, Bearpaw Shale, and Lebo Shale Member consist chiefly of highly mineralized shales that yield either no water or highly mineralized water that is not useable.

The alluvial and terrace deposits along the river valleys and in the inner valleys of most streams are a significant source of ground water in the survey area. The coarse textured deposits are the most permeable zones in the area. Yields from the aquifers range from 10 to 1,500 gallons of water per minute.

Consolidated bedrock is another source of ground water in a large part of the survey area. Wells that penetrate the permeable bedrock provide water supplies for several towns and some industries and provide a large percentage of the water used for domestic purposes and by livestock. The drilling depth required to penetrate a given formation varies with location and elevation.

Water quality varies greatly because of differences in the chemical characteristics and the content of dissolved solids. These variations depend upon the geology and precipitation in an area. The permeability and recharge characteristics of the aquifer influence water quality. In areas of small recharge and slowly permeable aquifers, water moves slowly and obtains high concentrations of dissolved solids. Water from shallow depths (less than 125 feet) contains considerable amounts of calcium and magnesium and is therefore hard. Water from greater depths contains only small amounts of calcium and magnesium and is therefore soft. The soft water, which is a sodium bicarbonate water, is generally satisfactory for domestic purposes but can be unfit for irrigation. The mineral content generally increases with increasing depth.

The most important bedrock aquifers in the survey area include the Fox Hills Sandstone, the Hell Creek Sandstone, the Tongue River Sandstone, and clinker and coal beds. Artesian wells that flow along the flood plain of the Yellowstone River derive their water from the Lance Aquifer. Artesian wells along the flood plain of the Tongue River in the vicinity of Ashland and Birney derive water from Fort Union Aquifers. The water from all of the flowing artesian wells is soft.

In the northern part of Rosebud County the Judith River Formation and the Eagle Formation are penetrated by wells. The water is highly mineralized but can be used by livestock.

Climate

The survey area is usually warm in summer and has frequent hot days. In winter, periods of very cold weather occur when arctic air moves in from the north or northeast. Cold periods alternate with milder periods. Most precipitation falls as rain during the warmer part of the year. The rain is normally heaviest in late spring and early summer. Winter snowfalls are frequent, but the snow cover usually disappears during mild periods.

The three tables at the end of this section give climate data as recorded at Birney, Brandenburg, Colstrip, Ingomar, Lame Deer, and Rock Springs, Montana, during the period 1961 to 1990.

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

Of the total annual precipitation, an average of about 10 inches, or about 77 percent, usually falls in April through September. The growing season for most crops falls within this period. Thunderstorms occur on about 30 days each year.

The average seasonal snowfall is 30 to 40 inches. About 30 to 40 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 75 percent. The sun shines 75 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 12 miles per hour, in late winter and spring.

TEMPERATURE AND PRECIPITATION

(Recorded in the period 1961-90 at Birney, Brandenburg, Colstrip, Ingomar, Lame Deer, and Rock Springs, Montana)

Month	Temperature					Precipitation					
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
° F	° F	° F	° F	° F	Units	In	In	In		In	
BIRNEY:											
January----	32.8	4.6	18.7	58	-33	1	0.51	0.22	0.75	1	6.4
February---	40.2	12.0	26.1	65	-25	9	.43	.16	.65	1	6.4
March-----	49.6	20.4	35.0	75	-17	54	.67	.26	1.02	2	3.9
April-----	62.2	30.4	46.3	86	12	218	1.37	.54	2.06	3	3.3
May-----	71.5	39.8	55.7	93	22	476	2.13	1.32	2.86	5	.3
June-----	81.2	48.7	65.0	101	32	740	2.71	1.69	3.63	5	.0
July-----	90.1	53.7	71.9	104	38	977	1.15	.44	1.75	3	.0
August-----	87.9	51.0	69.5	103	36	897	.90	.34	1.37	2	.0
September--	75.5	40.7	58.1	96	22	543	1.37	.59	2.12	3	.5
October----	64.2	30.3	47.3	86	10	244	.95	.44	1.45	2	.8
November---	45.6	18.1	31.9	72	-13	30	.69	.35	.99	2	3.9
December---	34.7	7.3	21.0	61	-31	3	.58	.26	.86	2	6.9
Yearly:											
Average---	61.3	29.8	45.5	---	---	---	---	---	---	---	---
Extreme---	108	-46	---	106	-37	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,192	13.46	9.62	15.67	31	32.5

See footnote at end of table.

TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation					
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with snowfall 0.10 inch or more	Average	
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--			
° F	° F	° F	° F	° F	Units	In	In	In	In	In		
BRANDENBERG:												
January----	31.0	7.5	19.3	57	-31	4	0.62	0.30	0.89	2	8.2	
February----	38.3	14.0	26.2	65	-25	13	.50	.22	.73	1	6.4	
March-----	47.3	21.8	34.6	74	-13	58	.72	.34	1.04	2	6.0	
April-----	59.8	31.7	45.7	86	11	215	1.60	.52	2.49	3	4.4	
May-----	70.0	41.1	55.6	94	24	483	2.25	1.56	2.88	6	.7	
June-----	80.3	49.8	65.1	102	33	753	2.46	1.37	3.42	6	.0	
July-----	89.7	54.9	72.3	105	38	988	.99	.42	1.48	2	.0	
August-----	87.3	52.4	69.8	104	36	925	1.15	.35	1.80	2	.0	
September--	74.1	41.9	58.0	97	23	543	1.37	.40	2.16	3	.9	
October----	61.9	32.5	47.2	85	10	254	1.12	.50	1.79	3	1.1	
November---	44.8	20.9	32.8	72	-13	42	.76	.31	1.15	2	5.8	
December---	33.4	10.5	21.9	61	-31	7	.70	.36	.99	2	9.0	
Yearly:												
Average----	59.8	31.6	45.7	---	---	---	---	---	---	---	---	
Extreme----	111	-44	---	106	-35	---	---	---	---	---	---	
Total-----	---	---	---	---	---	4,286	14.24	10.97	16.75	34	42.5	

See footnote at end of table.

TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with snowfall 0.10 inch or more	
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--		
<u>° F</u>	<u>° F</u>	<u>° F</u>	<u>° F</u>	<u>° F</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>		
COLSTRIP:											
January----	34.2	8.8	21.5	61	-28	12	0.63	0.23	0.95	2	5.6
February----	40.8	15.0	27.9	66	-22	20	.51	.23	.75	1	4.6
March-----	48.2	21.9	35.1	74	-10	65	.78	.37	1.13	2	5.8
April-----	60.1	31.5	45.8	85	10	220	1.51	.42	2.39	3	4.2
May-----	70.0	41.1	55.5	92	24	479	2.53	1.46	3.47	6	.6
June-----	79.7	49.7	64.7	99	33	729	2.64	1.48	3.68	6	.0
July-----	88.6	54.7	71.7	102	40	965	1.17	.48	1.76	3	.0
August-----	86.8	52.5	69.7	102	37	906	1.22	.49	1.92	2	.0
September--	74.7	42.6	58.6	97	24	558	1.45	.44	2.27	3	.7
October----	62.5	33.0	47.7	86	12	271	1.17	.30	1.94	3	1.2
November---	46.8	21.7	34.2	73	-10	57	.56	.29	.80	2	4.3
December---	35.7	11.0	23.3	62	-27	13	.62	.32	.92	2	7.5
Yearly:											
Average----	60.7	32.0	46.3	---	---	---	---	---	---	---	---
Extreme----	111	-38	---	104	-32	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,296	14.79	9.72	18.03	35	34.5

See footnote at end of table.

TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation					
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with snowfall 0.10 inch or more	Average	
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--			
	° F	° F	° F	° F	° F	Units	In	In	In	In	In	
INGOMAR:												
January----	29.9	3.6	16.7	59	-39	4	0.35	0.13	0.54	1	8.4	
February----	37.3	10.8	24.0	65	-30	12	.22	.08	.34	0	4.7	
March-----	47.3	19.8	33.6	74	-17	50	.37	.19	.53	1	4.7	
April-----	60.3	29.9	45.1	85	9	196	.93	.33	1.43	2	3.3	
May-----	70.5	40.4	55.5	92	23	468	2.17	1.11	3.09	5	1.2	
June-----	80.3	49.5	64.9	99	33	739	2.10	.93	3.09	5	.0	
July-----	89.1	55.0	72.1	103	40	973	1.34	.41	2.10	3	.0	
August-----	87.9	52.4	70.2	102	36	926	.97	.41	1.44	2	.0	
September--	75.2	40.9	58.1	97	22	521	1.33	.27	2.16	2	.4	
October----	63.8	30.4	47.1	87	8	251	.64	.21	1.06	2	.9	
November---	45.3	17.4	31.3	74	-17	37	.33	.13	.52	1	5.0	
December---	32.8	5.9	19.4	63	-38	7	.42	.15	.65	1	8.1	
Yearly:												
Average	60.0	29.7	44.8	---	---	---	---	---	---	---	---	
Extreme	107	-54	---	104	-44	---	---	---	---	---	---	
Total	---	---	---	---	---	4,184	11.17	9.06	13.18	25	36.7	

See footnote at end of table.

TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation					
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snowfall	
				Maximum temperature higher than--	Minimum temperature lower than--			Less than--	More than--			
<u>°</u> <u>F</u>	<u>°</u> <u>F</u>	<u>°</u> <u>F</u>	<u>°</u> <u>F</u>	<u>°</u> <u>F</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>		
LAME DEER:												
January----	33.7	5.0	19.4	59	-32	3	0.55	0.27	0.78	1	9.7	
February---	41.3	12.3	26.8	64	-25	9	.64	.25	.97	2	7.8	
March-----	48.7	19.5	34.1	73	-12	47	.86	.47	1.19	2	7.2	
April-----	60.2	28.2	44.2	84	7	185	1.53	.41	2.43	3	5.2	
May-----	69.4	37.8	53.6	91	19	412	3.14	1.59	4.48	6	.0	
June-----	79.5	46.0	62.8	98	30	643	2.81	1.62	3.86	6	.0	
July-----	89.8	51.4	70.6	103	36	930	1.13	.51	1.67	2	.0	
August-----	88.7	48.6	68.6	102	33	862	1.10	.34	1.71	2	.0	
September--	76.5	38.3	57.4	97	19	507	1.43	.43	2.25	3	.7	
October----	64.1	28.7	46.4	87	8	226	1.10	.45	1.72	3	1.1	
November---	46.1	17.7	31.9	73	-15	34	.75	.38	1.07	2	6.2	
December---	35.0	7.3	21.1	60	-34	4	.70	.38	.98	2	8.6	
Yearly:												
Average---	61.1	28.4	44.7	---	---	---	---	---	---	---	---	
Extreme---	109	-51	---	105	-38	---	---	---	---	---	---	
Total-----	---	---	---	---	---	3,861	15.72	9.00	18.26	34	46.5	

See footnote at end of table.

TEMPERATURE AND PRECIPITATION--Continued

Month	Temperature						Precipitation					
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with snowfall	Average	
				temperature higher than--	temperature lower than--			Less than--	More than--			
	<u>° F</u>	<u>° F</u>	<u>° F</u>	<u>° F</u>	<u>° F</u>	<u>Units</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>	<u>In</u>	
ROCK SPRINGS:												
January----	26.5	4.8	15.6	52	-32	2	0.30	0.11	0.48	0	3.8	
February---	32.7	10.7	21.7	61	-26	7	.20	.07	.34	0	2.6	
March-----	43.5	19.7	31.6	71	-15	38	.31	.17	.44	1	1.8	
April-----	56.9	30.2	43.5	83	5	170	1.02	.34	1.57	2	1.1	
May-----	67.2	40.5	53.8	92	22	425	2.20	1.02	3.21	5	.0	
June-----	77.3	49.3	63.3	99	33	676	2.45	1.35	3.42	5	.0	
July-----	86.0	54.4	70.2	103	39	908	1.40	.74	2.07	3	.0	
August-----	84.7	53.0	68.8	101	36	853	.87	.42	1.36	2	.0	
September--	71.9	42.0	57.0	95	23	492	1.24	.29	1.98	2	.0	
October----	60.6	32.2	46.4	84	10	229	.68	.20	1.16	2	.3	
November---	42.3	18.8	30.6	70	-14	37	.33	.10	.52	1	1.7	
December---	29.2	7.0	18.1	59	-33	5	.29	.12	.45	0	4.0	
Yearly:												
Average--	56.6	30.2	43.4	---	---	---	---	---	---	---	---	---
Extreme--	107	-40	---	103	-35	---	---	---	---	---	---	---
Total----	---	---	---	---	---	3,840	11.28	8.20	13.88	23	15.3	

*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 (40 degrees F).

FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1961-90 at Birney, Brandenburg,
Colstrip, Ingomar, Lame Deer, and Rock Springs, Montana)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
BIRNEY:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 17	May 24	June 6
2 years in 10 later than--	May 11	May 18	June 1
5 years in 10 later than--	Apr. 30	May 8	May 21
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 20	Sept. 11	Sept. 1
2 years in 10 earlier than--	Sept. 26	Sept. 16	Sept. 6
5 years in 10 earlier than--	Oct. 8	Sept. 26	Sept. 16
BRANDENBERG:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 6	May 20	June 3
2 years in 10 later than--	May 1	May 15	May 28
5 years in 10 later than--	Apr. 22	May 4	May 17
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 20	Sept. 12	Sept. 3
2 years in 10 earlier than--	Sept. 25	Sept. 17	Sept. 7
5 years in 10 earlier than--	Oct. 6	Sept. 27	Sept. 15

FREEZE DATES IN SPRING AND FALL--Continued

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
COLSTRIP:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 7	May 21	June 4
2 years in 10 later than--	May 2	May 15	May 29
5 years in 10 later than--	Apr. 22	May 3	May 17
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 21	Sept. 13	Sept. 7
2 years in 10 earlier than--	Sept. 28	Sept. 19	Sept. 12
5 years in 10 earlier than--	Oct. 10	Sept. 30	Sept. 22
INGOMAR:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 9	May 26	May 31
2 years in 10 later than--	May 4	May 21	May 27
5 years in 10 later than--	Apr. 26	May 9	May 18
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 19	Sept. 6	Sept. 4
2 years in 10 earlier than--	Sept. 25	Sept. 12	Sept. 8
5 years in 10 earlier than--	Oct. 7	Sept. 23	Sept. 15

FREEZE DATES IN SPRING AND FALL--Continued

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
LAME DEER:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 20	May 31	June 18
2 years in 10 later than--	May 14	May 25	June 11
5 years in 10 later than--	May 2	May 15	May 29
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 13	Sept. 4	Aug. 21
2 years in 10 earlier than--	Sept. 19	Sept. 10	Aug. 27
5 years in 10 earlier than--	Sept. 30	Sept. 20	Sept. 7
ROCK SPRINGS:			
Last freezing temperature in spring:			
1 year in 10 later than--	May 10	May 19	May 31
2 years in 10 later than--	May 5	May 14	May 26
5 years in 10 later than--	Apr. 25	May 5	May 17
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 19	Sept. 10	Sept. 4
2 years in 10 earlier than--	Sept. 25	Sept. 16	Sept. 9
5 years in 10 earlier than--	Oct. 7	Sept. 27	Sept. 18

GROWING SEASON

(Recorded in the period 1961-90 at Birney,
Brandenberg, Colstrip, Ingomar, Lame Deer, and
Rock Springs, Montana)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
BIRNEY:			
9 years in 10	137	120	93
8 years in 10	145	127	101
5 years in 10	161	141	118
2 years in 10	176	154	134
1 year in 10	184	161	143
BRANDENBERG:			
9 years in 10	147	126	99
8 years in 10	153	133	106
5 years in 10	166	146	120
2 years in 10	178	158	134
1 year in 10-	185	165	142
COLSTRIP:			
9 years in 10	147	127	101
8 years in 10	155	135	110
5 years in 10	170	149	128
2 years in 10	184	163	145
1 year in 10	192	170	154
INGOMAR:			
9 years in 10	141	115	106
8 years in 10	149	122	110
5 years in 10	163	135	119
2 years in 10	178	148	128
1 year in 10	185	155	133

GROWING SEASON--Continued

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
LAME DEER:			
9 years in 10	120	109	73
8 years in 10	129	116	83
5 years in 10	148	129	102
2 years in 10	166	142	121
1 year in 10	175	149	131
ROCK SPRINGS:			
9 years in 10	141	123	106
8 years in 10	149	131	113
5 years in 10	163	145	125
2 years in 10	177	159	138
1 year in 10	185	167	144

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map units in this survey have been grouped for broad interpretive purposes. Each of the broad groups and the map units in each group are described on the following pages.

Map Unit Descriptions

The State Soil Geographic Data Base (STATSGO) for Montana is the base for the general soil map of Rosebud County Area and part of Big Horn County, Montana. The map symbols are the same as those used for the STATSGO map units. In each major soil group, only two or three of the major soils or miscellaneous areas in the map unit are listed for the map symbol. The textures given for the soils in the groups are for the fraction less than 2 millimeters (fine earth) of the particle-size class in the control section. For more information about the general soil map units, refer to the STATSGO map for Montana.

Dominantly Nearly Level to Moderately Sloping, Very Deep, Well Drained, Loamy and Clayey Soils that Formed in Alluvium; on Flood Plains, Stream Terraces, and Alluvial Fans; Used Mainly for Irrigated Crops, Dryland Crops, or Range

148—Creed-Gerdrum

These soils are nearly level to moderately sloping. They are clayey. Creed soils are on stream terraces, and Gerdrum soils are on stream terraces and alluvial fans. The soils in this unit are sodium and salt affected and are used mainly for range.

160—Marvan-Davidell-Harlem

These soils are nearly level or gently sloping. Marvan soils are clayey and are sodium and salt affected. They are on stream terraces. Davidell soils are loamy. They are on alluvial fans and stream terraces. Harlem soils are clayey. They are on flood plains and are subject to flooding. Marvan and Davidell soils are used mainly for range, and Harlem soils are used mainly for irrigated crops.

190—Evanston-Lonna

These soils are nearly level to moderately sloping and are loamy. They are on alluvial fans and stream terraces. The soils in this unit are used for range or for dryland crops.

227—Davidell-Havre-Gerdrum

These soils are nearly level to moderately sloping. Davidell soils are loamy. They are on alluvial fans and streams. Havre soils are loamy. They are on flood plains and are subject to flooding. Gerdrum soils are clayey and are sodium and salt affected. They are on alluvial fans and stream terraces. Davidell and Gerdrum soils are used mainly for range, and Havre soils are used mainly for irrigated crops.

256—Havre-Harlem

These soils are nearly level. They are on flood plains. Havre soils are loamy, and Harlem soils are clayey. The soils in this unit are subject to flooding. They are used mainly for irrigated crops.

263—Havre-Spinekop-Kobar

These soils are nearly level to moderately sloping. Havre soils are loamy. They are on flood plains and are subject to flooding. Spinekop soils are loamy. They are on stream terraces. Kobar soils are clayey. They are on alluvial fans and stream terraces. The soils in this unit are used mainly for irrigated crops.

379—Marvan-Gerdrum

These soils are nearly level to moderately sloping and are clayey and sodium and salt affected. They are on alluvial fans and stream terraces. They are used mainly for range.

668—Yamac-Havre

These soils are nearly level and are loamy. Yamac soils are on alluvial fans and stream terraces. Havre soils are on flood plains and are subject to flooding. The soils in this unit are used mainly for range or for dryland crops.

Dominantly Nearly Level to Very Steep, Shallow to Very Deep, Well Drained or Excessively Drained, Sandy, Loamy, and Clayey Soils that Formed in Interbedded Shale and Sandstone, Consolidated Sandstone, Semiconsolidated, Loamy Sedimentary Beds, Semiconsolidated Shale, Colluvium, and Alluvium; on Sedimentary Plains, Hills, Alluvial Fans, and Relict Stream Terraces; Used Mainly for Range

55—Bonfri-Galbreth

These nearly level to moderately sloping, well drained soils are on sedimentary plains. They are loamy. Bonfri soils formed in interbedded shale and sandstone. Galbreth soils formed in consolidated sandstone. The soils in this unit are used mainly for range.

70—Bryant-Shambo-Doney

These soils are gently sloping to strongly sloping and are well drained. They are loamy. Bryant and Shambo soils are on sedimentary plains and hills. Bryant soils are very deep and formed in colluvium. Shambo soils are very deep and formed in alluvium. Doney soils are moderately deep and formed in semiconsolidated, loamy sedimentary beds. They are on hills. The soils in this unit are used mainly for range.

75—Yamac-Busby-Cabbart

These soils are nearly level to very steep and are well drained. They are loamy. Yamac and Busby soils are nearly level to moderately sloping and are very deep. They formed in alluvium and are on alluvial fans and sedimentary plains. Cabbart soils are moderately steep to very steep and are shallow. They formed in semiconsolidated, loamy sedimentary beds and are on hills. The soils in this unit are used mainly for range.

92—Delpoint-Yamac-Cabbart

These soils are gently sloping to very steep and are well drained. They are loamy. Delpoint soils are gently sloping to moderately sloping and are moderately deep. They formed in semiconsolidated, loamy sedimentary beds and are on sedimentary plains. Yamac soils are gently sloping to moderately sloping and are very deep. They formed in alluvium and are on alluvial fans and sedimentary plains. Cabbart soils are moderately steep to very steep and are shallow. They formed in semiconsolidated, loamy sedimentary beds and are on hills. The soils in this unit are used mainly for range.

103—Cabbart-Delpoint-Rock Outcrop

This unit is moderately steep to very steep and is on hills. Cabbart and Delpoint soils are well drained and are loamy. They formed in semiconsolidated, loamy sedimentary beds. Cabbart soils are shallow, and Delpoint soils are moderately deep. Rock outcrop consists mainly of semiconsolidated, loamy sedimentary beds. This unit is used mainly for range.

168—Yamac-Delpoint

These soils are gently sloping to moderately sloping and are well drained. They are loamy. Yamac soils are very deep. They formed in alluvium and are on alluvial fans. Delpoint soils are moderately deep. They formed in semiconsolidated, loamy sedimentary beds and are on sedimentary plains. The soils in this unit are used mainly for range.

173—Doney-Wayden

These soils are moderately steep to very steep and are well drained. They are on hills. Doney soils are moderately deep and are loamy. They formed in semiconsolidated, loamy sedimentary beds. Wayden soils are shallow and are clayey. They formed in semiconsolidated shale. The soils in this unit are used mainly for range.

354—Lonna-Cambeth

These soils are gently sloping to strongly sloping and are well drained. They are loamy. Lonna soils are very

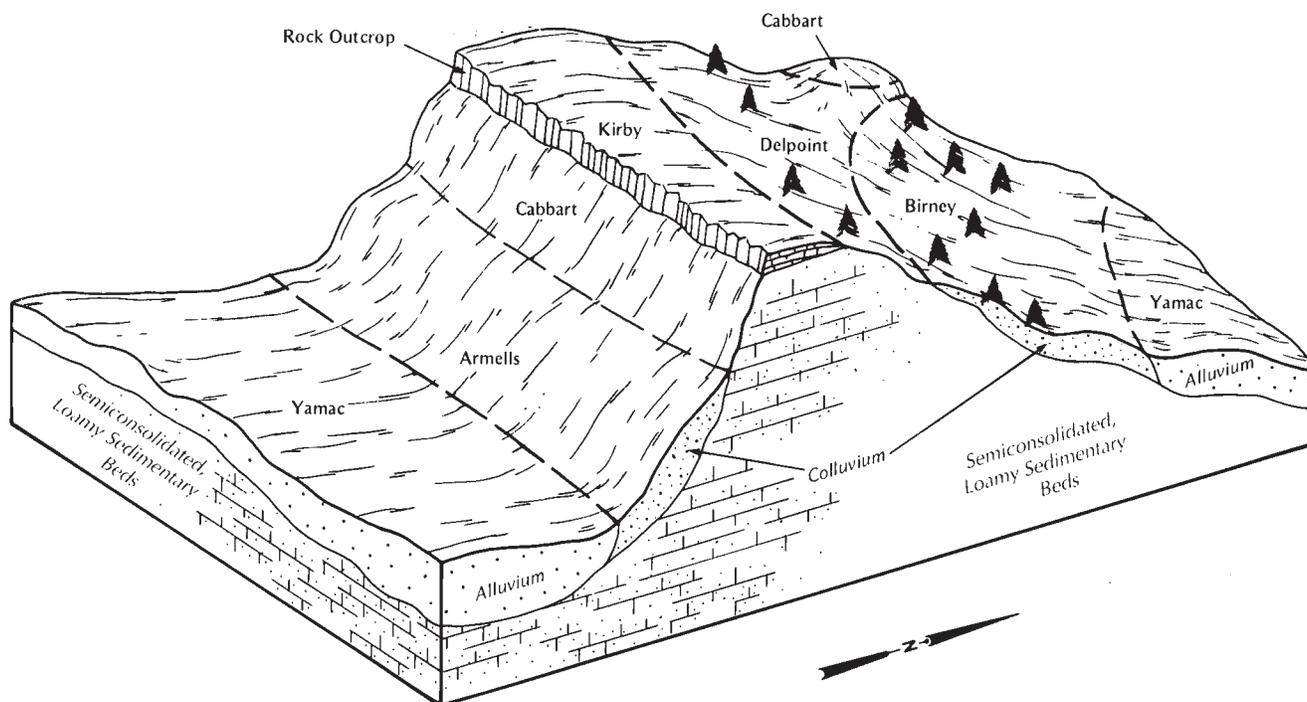


Figure 3.—Typical pattern of soils and parent material in the Yamac-Birney-Cabbart general soil map unit.

deep. They formed in alluvium and are on alluvial fans. Cambeth soils are moderately deep. They formed in semiconsolidated, loamy sedimentary beds and are on sedimentary plains and hills. The soils in this unit are used mainly for range or for dryland crops.

597—Vanstel-Tinsley

These soils are gently sloping to steep and are very deep. They formed in alluvium. Vanstel soils are gently sloping to moderately sloping and are well drained. They are loamy. They are on sedimentary plains and alluvial fans. Tinsley soils are moderately steep or steep and are excessively drained. They are sandy and have numerous rock fragments. They are on relict stream terraces. The soils in this unit are used mainly for range.

612—Bitton-Yamac

These soils are gently sloping to very steep and are very deep. They are well drained. Bitton soils are moderately steep to very steep. They are loamy and have numerous rock fragments. They formed in colluvium derived from baked sandstone and shale and are on hills. Yamac soils are gently sloping to moderately sloping and are loamy. They formed in alluvium and are on alluvial fans. The soils in this unit are used mainly for range.

Dominantly Gently Sloping to Very Steep, Shallow to Very Deep, Well Drained and Excessively Drained, Loamy and Clayey Soils that Formed in Colluvium, Alluvium, and Material Weathered from Baked Sandstone and Shale, Semiconsolidated, Loamy Sedimentary Beds, Alluvium, and Semiconsolidated Shale; on Alluvial Fans and Hills; Used Mainly for Range or Woodland

48—Bitton-Cabba-Shambo

These soils are gently sloping to very steep and are well drained. Bitton soils are strongly sloping to very steep and are very deep. They are loamy and have numerous rock fragments. They formed in colluvium derived from baked sandstone and shale and are on hills. Cabba soils are strongly sloping to very steep and are shallow. They are loamy. They formed in semiconsolidated, loamy sedimentary beds and are on hills. Shambo soils are gently sloping to strongly sloping and are very deep. They are loamy. They formed in alluvium and are on alluvial fans. The soils in this unit are used mainly for range.

89—Yamac-Birney-Cabbart

These soils are moderately steep to very steep and are well drained. They are on hills (fig. 3). Yamac soils are very deep and are loamy. They formed in alluvium.

Birney soils are very deep, are loamy, and have numerous rock fragments. They formed in colluvium derived from baked sandstone and shale. Cabbart soils are shallow and are loamy. They formed in semiconsolidated, loamy sedimentary beds. The soils in this unit are used mainly for range.

321—Lamedeer-Ringling-Twin Creek

These soils are moderately steep to very steep and are very deep. They are on hills. Lamedeer soils are well drained, are loamy, and have numerous rock fragments. They formed in colluvium derived from baked sandstone and shale. Ringling soils are excessively drained, are loamy, and have numerous rock fragments. They formed in material weathered from baked sandstone and shale. Twin Creek soils are well drained and are loamy. They formed in alluvium derived from baked sandstone and shale. The soils in this unit are used mainly as woodland.

676—Yawdim-Delpoint

These soils are moderately steep to very steep and are well drained. They are hills. Yawdim soils are shallow and are clayey. They formed in semiconsolidated shale. Delpoint soils are moderately deep and are loamy. They formed in semiconsolidated, loamy sedimentary beds. The soils in this unit are used mainly for range.

Dominantly Nearly Level to Very Steep, Shallow to Very Deep, Well Drained, Loamy and Clayey Soils that Formed in Semiconsolidated, Loamy Sedimentary Beds, Semiconsolidated Shale, and Alluvium; on Sedimentary Plains, Hills, and Alluvial Fans; Used Mainly for Range

24—Bullock-Cabbart-Rock Outcrop

This unit is used mainly for range. The well drained Bullock and Cabbart soils are loamy. They formed in semiconsolidated, loamy sedimentary beds. Bullock soils are gently sloping to moderately sloping and are moderately deep. They are on sedimentary plains. Cabbart soils are strongly sloping to steep and are shallow. They are on hills. Rock outcrop consists mainly of semiconsolidated, loamy sedimentary beds.

287—Davidell-Sumatra

These soils are very deep and are well drained. They are loamy. They formed in alluvium. Davidell soils are nearly level or gently sloping. They are on alluvial fans and sedimentary plains. Sumatra soils are moderately sloping to steep. They are on sedimentary plains and hills. They have high levels of sodium and salts. The soils in this unit are used mainly for range.

339—Abor-Rock Outcrop

This unit is moderately sloping to steep. It is used mainly for range. Abor soils are moderately deep and are well drained. They are clayey and formed in semiconsolidated shale on sedimentary plains and hills. Rock outcrop consists mainly of semiconsolidated shale.

414—Neldore-Abor

These soils are moderately sloping to very steep and are well drained. They are clayey. They formed in semiconsolidated shale. Neldore soils are shallow. They are on hills. Abor soils are moderately deep. They are on sedimentary plains and hills. The soils in this unit are used mainly for range.

605—Volborg-Louscot

These soils are well drained. Volborg soils are gently sloping to steep and are shallow. They are clayey. They formed in semiconsolidated shale on sedimentary plains and hills. Louscot soils are nearly level or gently sloping and are very deep. They are loamy. They formed in alluvium and are on alluvial fans. Louscot soils are extremely acid and contain high levels of salts and aluminum. The soils in this unit are used mainly for range.

689—Zatoville-Yawdim-Neldore

These soils are well drained and are clayey. Zatoville soils are nearly level to moderately sloping and are very deep. They formed in alluvium on sedimentary plains. They have high levels of sodium and salts. Yawdim and Neldore soils are strongly sloping to steep and are shallow. They formed in semiconsolidated shale on hills. The soils in this unit are used mainly for range.

Formation and Classification of the Soils

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

Formation of the Soils

Each soil in the survey area is a natural, three-dimensional body on the earth's surface that supports or is capable of supporting plants. Physical and chemical processes have determined its morphology. These processes have resulted from the interaction of five factors—parent material, climate, living organisms, relief, and time. Differences between soils can be traced to differences in one or more of these factors.

Climate and plant and animal life are the active factors of soil formation. They act on parent material through weathering, slowly changing it into a natural body with individual, related horizons. The effects of climate and plant and animal life are conditioned by relief and time. Parent material affects the kind of soil that forms. It is the dominant factor in young soils, but its influence generally lessens as the soil develops. Time is necessary for the formation of a soil, but the length of time required depends upon the other factors of soil formation.

Climate

Climate, an active force in the formation of soils, is determined mainly by temperature and precipitation. Erosion and alternate periods of freezing and thawing break down rock into the material in which a soil forms. Water and wind are active agents in transporting and separating weathered material. The weathered material is further broken down by chemical reactions, such as solution and hydration. Precipitation and temperature affect the kind and amount of native vegetation that grows on the soil. As vegetation decays, it produces organic matter that subsequently becomes part of the soil. Soils with cool temperatures and high precipitation,

such as Bryant soils, generally have a dark-colored surface layer. Soils with warm temperatures and low precipitation, such as Yamac soils, generally have a light-colored surface layer. In this survey area, precipitation is 10 to 19 inches per year and the mean annual temperature is 38 to 46 degrees F.

Living Organisms

Living organisms are active in the formation of soils. Organic matter is the main source of the dark color of the surface layer. Fungi and algae inhabit and help to decompose rocks. As the rock decomposes, grasses, shrubs, and trees are able to grow and support animal life.

The kinds of plants and animals in and on the soils largely determine the kinds and amount of organic matter added to the soil and the manner in which this matter is incorporated into the mineral part of the soil. Roots, rodents, and insects penetrate the soil and influence its structure. Leaves, roots, and whole plants remain in the surface layer, where they are changed to humus by micro-organisms, by chemicals in the soil, and by insects.

The native vegetation consists of short and mid grasses, forbs, and shrubs in most parts of the survey area, and ponderosa pine and juniper mainly in the southern part. Common rodents include gophers, prairie dogs, badgers, rabbits, and field mice. Many of the pebbles and cobbles on the surface of terraces were dug up by the burrowing of these rodents.

Relief

Relief, or topography, is determined by the uplift of mountain masses and the resistance of bedrock and geologic formations to erosion by water and wind. In the eroded uplands of the survey area, runoff water has carved deep valleys into the original bedrock. The rugged relief contrasts sharply with the smooth, low relief of the stream terraces and flood plains along the river valleys.

On uplands, soil horizons decrease in number, distinctness, and thickness as slope increases. Steep soils that have rapid runoff have many characteristics

similar to those of soils that formed in arid climates. Nearly level to moderately sloping soils that receive runoff from the soils above them on the landscape have many characteristics of soils that formed in a more humid climate. Macar soils on moderately steep hills and Shambo soils on gently sloping and moderately sloping alluvial fans are examples of this pattern. Macar soils have a thin, light-colored A horizon, and the subsoil extends to a depth of 18 inches. In contrast, Shambo soils have a thicker, dark-colored A horizon, and the subsoil extends to a depth of 28 inches.

Parent Material

Many of the soils in the survey area formed in place over semiconsolidated sedimentary beds or shale. Some soils formed in alluvium and colluvium and were deposited in major valleys and on bordering uplands. Soils that formed in material derived from semiconsolidated, sandy sedimentary beds, such as Yetull soils, are generally sandy. Soils that formed in residuum derived from shale, such as Neldore soils, are clayey. The basic constituent of shale is clay. Soils that formed in mixed alluvium derived from semiconsolidated, loamy sedimentary beds, such as Yamac soils, are loamy. Some of the soils in the area, such as Gerdrum soils, acquired salt and sodium from the parent material. The salts and sodium in these saline, alkaline, or saline-alkaline soils limit the kind and amount of plants that can grow on them. The density of the parent rock and its mineral composition can limit the rate of weathering and depth of the soil. Castner soils, for example, are shallow because they formed in hard sandstone.

Time

The changes that take place in a soil over long periods of time are called soil genesis. They give the soil distinct layers, or horizons. The kinds and arrangement of these horizons are called soil morphology and are described in terms of color, texture, structure, consistence, thickness, and permeability.

Soils can be classified from young to mature according to their approximate age. The age of a soil is generally indicated by the thickness and distinctness of the subsurface horizons, the content of organic matter and clay, the depth to which soluble material is leached, and the form and distribution of calcium carbonate and gypsum in the soil.

The young Havre soils are Entisols that formed in alluvium on flood plains. They contain little organic matter from which to form an A horizon and have no clay accumulation. Little translocation of carbonates has occurred in these soils.

The mature Evanston soils are Mollisols that formed

in parent material that is similar to that of the Havre soils but is much older. Evanston soils formed in alluvium on alluvial fans and stream terraces. They contain enough organic matter to have a dark A horizon and also have a distinct clay accumulation in the subsoil. Nearly all of the carbonates have been leached below a depth of about 12 inches.

Classification of the Soils

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

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

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 Orthid (*Orth*, meaning true, plus *id*, from Aridisol).

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 Camborthids (*Camb*, meaning to change, plus *orthid*, the suborder of the Aridisols that has an aridic moisture regime).

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

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth

where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is

fine-loamy, mixed Borollic Camborthids.

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

CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Abor-----	Fine, montmorillonitic, frigid Udorthentic Chromusterts
Absher-----	Fine, montmorillonitic Borollic Natrargids
Alona-----	Fine-silty, mixed Borollic Camborthids
Antwerp-----	Fine-silty, mixed (calcareous), frigid Ustic Torriorthents
Armells-----	Loamy-skeletal, mixed (calcareous), frigid Ustic Torriorthents
Assinniboine-----	Fine-loamy, mixed Aridic Argiborolls
Barvon-----	Fine-loamy, mixed Entic Haploborolls
Belfield-----	Fine, montmorillonitic Glossic Natriborolls
Birney-----	Loamy-skeletal, mixed Borollic Camborthids
Bitton-----	Loamy-skeletal, mixed Typic Haploborolls
Blackhall-----	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Bonfri-----	Fine-loamy, mixed Borollic Haplargids
Borollic Camborthids-----	Borollic Camborthids
Brunelda-----	Fine, montmorillonitic, frigid Cambic Gypsiorthids
Bryant-----	Fine-silty, mixed Typic Haploborolls
Bullock-----	Fine-loamy, mixed Borollic Natrargids
Busby-----	Coarse-loamy, mixed Borollic Camborthids
Cabba-----	Loamy, mixed (calcareous), frigid, shallow Typic Ustorthents
Cabbart-----	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Cambeth-----	Fine-silty, mixed Borollic Camborthids
Canburn-----	Fine-loamy, mixed (calcareous), frigid Cumulic Haplaquolls
Castner-----	Loamy-skeletal, mixed Lithic Haploborolls
Chinook-----	Coarse-loamy, mixed Aridic Haploborolls
Coopers-----	Fine-loamy, mixed Borollic Camborthids
Creed-----	Fine, montmorillonitic Borollic Natrargids
Davidell-----	Fine-silty, mixed Borollic Haplargids
Degrad-----	Fine-loamy over sandy or sandy-skeletal, mixed Aridic Argiborolls
Delpoint-----	Fine-loamy, mixed Borollic Camborthids
Doney-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Evanston-----	Fine-loamy, mixed Aridic Argiborolls
Fergus variant-----	Fine-silty, mixed Typic Argiborolls
Floweree-----	Fine-silty, mixed Aridic Haploborolls
Fluentic Haploborolls-----	Fluentic Haploborolls
Forelle-----	Fine-loamy, mixed Borollic Haplargids
Galbreth-----	Loamy, mixed, shallow Borollic Camborthids
Gerdrum-----	Fine, montmorillonitic Borollic Natrargids
Glendive-----	Coarse-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Hanly-----	Sandy, mixed, frigid Ustic Torrifluvents
Harlem-----	Fine, montmorillonitic (calcareous), frigid Ustic Torrifluvents
Havre-----	Fine-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Ivanell-----	Fine-silty, mixed Borollic Haplargids
Kirby-----	Loamy-skeletal over fragmental, mixed (calcareous), frigid Ustic Torriorthents
Kobar-----	Fine, montmorillonitic Borollic Camborthids
Kremlin-----	Fine-loamy, mixed Aridic Haploborolls
Lamedeer-----	Loamy-skeletal, mixed, frigid Udic Ustochrepts
Lihen-----	Sandy, mixed Entic Haploborolls
Lonna-----	Fine-silty, mixed Borollic Camborthids
Louscot-----	Fine-silty, mixed, acid, frigid Ustic Torriorthents
Macar-----	Fine-loamy, mixed, frigid Typic Ustochrepts
Marmarth-----	Fine-loamy, mixed Aridic Argiborolls
Marvan-----	Fine, montmorillonitic, frigid Udorthentic Chromusterts
Neldore-----	Clayey, montmorillonitic, nonacid, frigid, shallow Ustic Torriorthents
Niler-----	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Nobe-----	Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents
Orinoco-----	Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents
Rahworth-----	Fine-silty, mixed Borollic Camborthids
Ralld-----	Clayey, montmorillonitic, shallow Borollic Natrargids
Redcreek-----	Loamy, mixed (calcareous), frigid Lithic Ustic Torriorthents
Ringling-----	Loamy-skeletal over fragmental, mixed Typic Haploborolls
Rominell-----	Fine-loamy, mixed Borollic Natrargids
Sagedale-----	Fine, montmorillonitic, frigid Typic Ustochrepts
Savage-----	Fine, montmorillonitic Typic Argiborolls
Shambo-----	Fine-loamy, mixed Typic Haploborolls
Spang-----	Coarse-loamy, mixed Borollic Camborthids

CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Spinekop-----	Fine-loamy, mixed Borollic Camborthids
Straw-----	Fine-loamy, mixed Cumulic Haploborolls
Sumatra-----	Fine-silty, mixed, frigid Ustic Torriorthents
Tinsley-----	Sandy-skeletal, mixed, frigid Typic Ustorthents
Twilight-----	Coarse-loamy, mixed Borollic Camborthids
Twin Creek-----	Fine-loamy, mixed Typic Haploborolls
Typic Fluvaquents-----	Typic Fluvaquents
Typic Haplaquepts-----	Typic Haplaquepts
Ustic Torrifluvents-----	Typic Torrifluvents
Ustic Torriorthents-----	Typic Torriorthents
Vaeda-----	Fine, montmorillonitic, nonacid, frigid Ustic Torriorthents
Vanda-----	Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents
Vanstel-----	Fine-silty, mixed Borollic Haplargids
Volborg-----	Clayey, montmorillonitic, acid, frigid, shallow Ustic Torriorthents
Wayden-----	Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents
Weingart-----	Fine, montmorillonitic Borollic Natrargids
Yamac-----	Fine-loamy, mixed Borollic Camborthids
Yawdim-----	Clayey, montmorillonitic (calcareous), frigid, shallow Ustic Torriorthents
Yetull-----	Mixed, frigid Ustic Torripsamments
Zatoville-----	Fine, montmorillonitic, frigid Cambic Gypsiorthids

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Big Horn County	Rosebud County	Total--	
				Area	Extent
				Acres	Pct
1	Abor silty clay, 2 to 8 percent slopes-----	0	5,812	5,812	0.2
2	Abor silty clay, 8 to 15 percent slopes-----	0	1,579	1,579	*
3	Abor-Marvan silty clays, 2 to 8 percent slopes-----	0	22,158	22,158	0.7
4	Abor-Neldore silty clays, 4 to 15 percent slopes-----	0	31,068	31,068	0.9
5	Absher-Nobe complex, 0 to 4 percent slopes-----	0	5,661	5,661	0.2
6	Antwerp silty clay loam, 0 to 4 percent slopes-----	0	9,171	9,171	0.3
7	Armells-Cabbart complex, 25 to 70 percent slopes-----	276	13,937	14,213	0.4
8	Armells-Delpoint-Cabbart complex, 25 to 70 percent slopes-----	992	32,434	33,426	1.0
9	Armells-Kirby complex, 25 to 70 percent slopes-----	171	5,620	5,791	0.2
10	Armells-Kirby-Cabbart complex, 25 to 70 percent slopes-----	2,513	28,335	30,848	0.9
11	Assinniboine fine sandy loam, 2 to 8 percent slopes-----	0	1,940	1,940	0.1
12	Badland-----	0	22,872	22,872	0.7
13	Barvon-Lamedeer-Lamedeer, dry, complex, 35 to 70 percent slopes----	4,930	11,238	16,168	0.5
14	Barvon, dry-Doney-Cabba complex, 15 to 70 percent slopes-----	5,937	10,793	16,730	0.5
15	Belfield clay loam, 0 to 4 percent slopes-----	1,150	141	1,291	*
16	Birney channery loam, 15 to 25 percent slopes-----	32	5,011	5,043	0.2
17	Birney-Cabbart complex, moist, 25 to 70 percent slopes-----	0	6,380	6,380	0.2
18	Birney-Coopers-Kirby complex, 2 to 15 percent slopes-----	400	9,468	9,868	0.3
19	Birney-Kirby channery loams, 4 to 25 percent slopes-----	53	18,786	18,839	0.6
20	Birney-Kirby-Cabbart complex, 15 to 25 percent slopes-----	311	6,772	7,083	0.2
21	Birney, moist-Armells-Cabbart complex, 25 to 70 percent slopes-----	4,984	48,942	53,926	1.6
22	Birney, moist-Birney-Kirby channery loams, 15 to 25 percent slopes-----	1,264	7,734	8,998	0.3
23	Bitton-Doney-Ringling, dry, complex, 15 to 25 percent slopes-----	1,483	1,948	3,431	0.1
24	Bitton-Doney-Ringling, dry, complex, 25 to 70 percent slopes-----	360	3,429	3,789	0.1
25	Bitton-Ringling, dry, channery loams, 8 to 25 percent slopes-----	252	3,407	3,659	0.1
26	Bitton-Shambo complex, 4 to 15 percent slopes-----	158	1,872	2,030	0.1
27	Bitton-Twin Creek complex, 2 to 8 percent slopes-----	288	3,989	4,277	0.1
28	Bitton-Twin Creek-Ringling, dry, complex, 2 to 15 percent slopes----	2,187	11,215	13,402	0.4
29	Bitton, moist-Doney-Cabba complex, 15 to 70 percent slopes-----	1,325	2,635	3,960	0.1
30	Bitton, moist-Lamedeer, dry-Ringling, dry, channery loams, 15 to 25 percent slopes-----	1,323	5,658	6,981	0.2
31	Bitton, moist-Lamedeer, dry-Ringling, dry, channery loams, 25 to 70 percent slopes-----	20,560	26,281	46,841	1.4
32	Bitton, moist-Ringling, dry-Cabba complex, 25 to 70 percent slopes-----	5,919	9,016	14,935	0.5
33	Bonfri-Bullock, eroded-Cabbart complex, 4 to 25 percent slopes-----	0	10,252	10,252	0.3
34	Bonfri-Galbreth fine sandy loams, 1 to 8 percent slopes-----	0	12,117	12,117	0.4
35	Bonfri-Marmarth-Bullock fine sandy loams, 1 to 4 percent slopes-----	0	8,910	8,910	0.3
36	Borollic Camborthids-Ustic Torrifuvents complex, 0 to 8 percent slopes-----	312	49,300	49,612	1.5
37	Brunelda silty clay, 2 to 8 percent slopes-----	0	10,207	10,207	0.3
38	Brunelda-Gerdrum complex, 1 to 8 percent slopes-----	0	3,937	3,937	0.1
39	Brunelda-Vaeda-Nobe complex, 1 to 8 percent slopes-----	0	4,319	4,319	0.1
40	Bryant silt loam, 2 to 8 percent slopes-----	11,307	4,679	15,986	0.5
41	Bryant silt loam, 8 to 15 percent slopes-----	2,218	1,465	3,683	0.1
42	Bullock, eroded-Ralrod, warm, clay loams, 2 to 15 percent slopes----	0	14,189	14,189	0.4
43	Bullock, eroded-Rominell complex, 2 to 8 percent slopes-----	0	25,341	25,341	0.8
44	Busby fine sandy loam, 2 to 8 percent slopes-----	72	12,719	12,791	0.4
45	Busby fine sandy loam, 8 to 15 percent slopes-----	724	8,966	9,690	0.3
46	Busby loam, 0 to 2 percent slopes-----	0	965	965	*
47	Busby-Rock outcrop complex, 8 to 15 percent slopes-----	989	9,212	10,201	0.3
48	Busby-Twilight-Blackhall, warm, fine sandy loams, 2 to 8 percent slopes-----	125	12,459	12,584	0.4
49	Busby-Twilight-Blackhall, warm, fine sandy loams, 8 to 25 percent slopes-----	6,227	51,417	57,644	1.7
50	Busby-Yetull complex, 2 to 8 percent slopes-----	0	3,625	3,625	0.1
51	Busby-Yetull complex, 8 to 25 percent slopes-----	946	4,906	5,852	0.2
52	Cabba-Wayden-Rock outcrop complex, 25 to 70 percent slopes-----	1,053	827	1,880	0.1
53	Cabba-Wayden-Sagedale complex, 25 to 70 percent slopes-----	199	3,495	3,694	0.1
54	Cabbart-Armells-Rock outcrop complex, 25 to 70 percent slopes-----	847	5,951	6,798	0.2
55	Cabbart-Yawdim-Rock outcrop complex, 15 to 70 percent slopes-----	2,331	87,434	89,765	2.7
56	Cambeth silt loam, 2 to 8 percent slopes-----	274	31,079	31,353	0.9
57	Cambeth silt loam, 8 to 15 percent slopes-----	115	5,385	5,500	0.2

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Big Horn County	Rosebud County	Total--	
				Area	Extent
				Acres	Pct
58	Cambeth-Cabbart silt loams, 4 to 15 percent slopes-----	247	63,102	63,349	1.9
59	Cambeth-Cabbart complex, dissected, 8 to 25 percent slopes-----	0	49,896	49,896	1.5
60	Cambeth-Niler complex, 4 to 15 percent slopes-----	0	5,938	5,938	0.2
61	Castner-Shambo complex, 2 to 15 percent slopes-----	633	1,194	1,827	0.1
62	Chinook fine sandy loam, 2 to 8 percent slopes-----	636	3,466	4,102	0.1
63	Chinook fine sandy loam, alkali substratum, 2 to 8 percent slopes--	0	4,073	4,073	0.1
64	Cooers loam, 2 to 8 percent slopes-----	0	3,474	3,474	0.1
65	Cooers-Birney complex, 2 to 8 percent slopes-----	248	4,527	4,775	0.1
66	Cooers-Yamac loams, 2 to 8 percent slopes-----	94	4,360	4,454	0.1
67	Creed loam, sandy substratum, 0 to 2 percent slopes-----	0	3,258	3,258	0.1
68	Davidell loam, 2 to 4 percent slopes-----	0	34,301	34,301	1.0
69	Davidell silty clay loam, 0 to 2 percent slopes-----	0	10,901	10,901	0.3
70	Davidell-Antwerp silty clay loams, 0 to 4 percent slopes-----	0	18,262	18,262	0.6
71	Degrad sandy loam, 0 to 4 percent slopes-----	0	885	885	*
72	Delpoint-Cabbart loams, 25 to 70 percent slopes-----	1,143	20,280	21,423	0.6
73	Delpoint-Cabbart-Yamac loams, 8 to 25 percent slopes-----	4,419	201,467	205,886	6.2
74	Delpoint-Cabbart-Yawdim complex, 25 to 70 percent slopes-----	603	69,977	70,580	2.1
75	Delpoint-Galbreth complex, 2 to 8 percent slopes-----	0	9,075	9,075	0.3
76	Delpoint, moist-Delpoint-Cabbart loams, 15 to 25 percent slopes---	2,020	23,727	25,747	0.8
77	Delpoint, moist-Delpoint-Cabbart loams, 25 to 70 percent slopes---	0	7,733	7,733	0.2
78	Doney-Bitton-Cabba complex, 15 to 35 percent slopes-----	3,182	7,847	11,029	0.3
79	Evanston loam, 0 to 4 percent slopes-----	0	9,096	9,096	0.3
80	Fergus variant-Twin Creek complex, 2 to 8 percent slopes-----	18	1,385	1,403	*
81	Floweree silt loam, 0 to 2 percent slopes-----	534	1,665	2,199	0.1
82	Floweree silt loam, 2 to 8 percent slopes-----	437	5,730	6,167	0.2
83	Floweree-Vanstel silt loams, 0 to 4 percent slopes-----	0	1,931	1,931	0.1
84	Fluventic Haploborolls-Typic Fluvaquents complex, 0 to 4 percent slopes-----	822	692	1,514	*
85	Forelle loam, warm, 2 to 8 percent slopes-----	0	11,997	11,997	0.4
86	Forelle, warm-Gerdrum complex, 2 to 8 percent slopes-----	0	14,983	14,983	0.5
87	Galbreth sandy clay loam, 1 to 4 percent slopes-----	0	3,731	3,731	0.1
88	Gerdrum clay loam, 0 to 2 percent slopes-----	0	8,427	8,427	0.3
89	Gerdrum clay loam, 2 to 8 percent slopes-----	16	25,602	25,618	0.8
90	Gerdrum-Kobar silty clay loams, 0 to 2 percent slopes-----	0	2,232	2,232	0.1
91	Gerdrum-Kobar silty clay loams, 2 to 8 percent slopes-----	0	9,438	9,438	0.3
92	Gerdrum-Marvan silty clays, 2 to 8 percent slopes-----	0	7,059	7,059	0.2
93	Gerdrum-Vanda silty clays, 0 to 4 percent slopes-----	0	25,733	25,733	0.8
94	Gerdrum, shale substratum-Volborg, saline, complex, 1 to 4 percent slopes-----	0	3,137	3,137	0.1
95	Glendive loam, 0 to 2 percent slopes, occasionally flooded-----	0	6,230	6,230	0.2
96	Hanly-Glendive loams, 0 to 2 percent slopes, occasionally flooded--	0	2,117	2,117	0.1
97	Harlem silty clay loam, 0 to 2 percent slopes, occasionally flooded-----	0	3,479	3,479	0.1
98	Harlem silty clay, 0 to 2 percent slopes, occasionally flooded-----	15	4,937	4,952	0.1
99	Havre loam, 0 to 2 percent slopes-----	0	7,839	7,839	0.2
100	Havar silty clay loam, 0 to 2 percent slopes, occasionally flooded--	4,377	21,885	26,262	0.8
101	Havre silty clay loam, 0 to 2 percent slopes, occasionally flooded-----	0	8,261	8,261	0.2
102	Havre silty clay loam, moderately wet, 0 to 2 percent slopes, occasionally flooded-----	0	3,273	3,273	0.1
103	Havre silty clay loam, saline, 0 to 2 percent slopes, frequently flooded-----	0	3,927	3,927	0.1
104	Havre, Harlem, and Glendive soils, channeled, 0 to 2 percent slopes-----	1,397	46,406	47,803	1.4
105	Ivanell clay loam, 2 to 8 percent slopes-----	0	6,013	6,013	0.2
106	Ivanell-Davidell complex, 2 to 8 percent slopes-----	0	22,450	22,450	0.7
107	Ivanell-Niler silty clay loams, 4 to 15 percent slopes-----	0	22,832	22,832	0.7
108	Kirby-Cabbart-Rock outcrop complex, 25 to 70 percent slopes-----	3,733	19,556	23,289	0.7
109	Kobar silty clay loam, 0 to 2 percent slopes-----	321	12,961	13,282	0.4
110	Kobar silty clay loam, 2 to 8 percent slopes-----	408	29,773	30,181	0.9
111	Kobar silty clay loam, 8 to 15 percent slopes-----	333	8,514	8,847	0.3
112	Kobar silty clay loam, gullied, 2 to 15 percent slopes-----	0	13,209	13,209	0.4

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Big Horn County	Rosebud County	Total--	
				Area	Extent
				Acres	Pct
113	Kobar silty clay, 0 to 2 percent slopes-----	0	4,998	4,998	0.2
114	Kobar silty clay, moderately wet, 0 to 2 percent slopes-----	0	3,409	3,409	0.1
115	Kobar-Cabbart-Yawdim complex, 8 to 25 percent slopes-----	544	26,730	27,274	0.8
116	Kremlin loam, 0 to 2 percent slopes-----	2,166	1,744	3,910	0.1
117	Kremlin loam, 2 to 8 percent slopes-----	1,272	7,123	8,395	0.3
118	Lamedeer-Lamedeer, dry-Ringling channery loams, 35 to 70 percent slopes-----	608	4,970	5,578	0.2
119	Lamedeer-Twin Creek, moist-Ringling complex, 4 to 15 percent slopes-----	0	5,244	5,244	0.2
120	Lamedeer-Twin Creek, moist-Ringling complex, 15 to 35 percent slopes-----	0	9,754	9,754	0.3
121	Lamedeer, dry-Bitton, moist-Ringling, dry, channery loams, 25 to 70 percent slopes-----	7,948	20,531	28,479	0.9
122	Lihen sandy loam, 15 to 35 percent slopes-----	0	1,589	1,589	*
123	Lonna silt loam, 0 to 2 percent slopes-----	51	7,461	7,512	0.2
124	Lonna silt loam, 2 to 8 percent slopes-----	1,066	33,616	34,682	1.0
125	Lonna silt loam, 8 to 15 percent slopes-----	90	7,401	7,491	0.2
126	Lonna silty clay loam, 0 to 2 percent slopes-----	0	3,932	3,932	0.1
127	Lonna silty clay loam, 2 to 8 percent slopes-----	0	11,011	11,011	0.3
128	Lonna-Alona silt loams, 0 to 2 percent slopes-----	0	5,134	5,134	0.2
129	Lonna-Alona silt loams, 2 to 8 percent slopes-----	0	8,910	8,910	0.3
130	Lonna-Antwerp silty clay loams, 0 to 2 percent slopes-----	0	3,148	3,148	0.1
131	Lonna-Antwerp silty clay loams, 2 to 8 percent slopes-----	0	8,130	8,130	0.2
132	Lonna-Cabbart-Yawdim complex, 8 to 25 percent slopes-----	961	20,579	21,540	0.6
133	Lonna-Cambeth silt loams, 2 to 8 percent slopes-----	0	59,843	59,843	1.8
134	Lousscot silt loam, 0 to 4 percent slopes-----	0	16,859	16,859	0.5
135	Macar-Doney-Rock outcrop complex, 15 to 45 percent slopes-----	11,485	1,996	13,481	0.4
136	Marmarth fine sandy loam, 2 to 8 percent slopes-----	0	4,515	4,515	0.1
137	Marmarth-Galbreth complex, 2 to 15 percent slopes-----	0	1,845	1,845	0.1
138	Marvan silty clay, 0 to 2 percent slopes-----	0	20,243	20,243	0.6
139	Marvan silty clay, 2 to 8 percent slopes-----	0	22,133	22,133	0.7
140	Marvan silty clay, saline, 2 to 8 percent slopes-----	0	6,491	6,491	0.2
141	Neldore silty clay, 4 to 25 percent slopes-----	0	56,500	56,500	1.7
142	Neldore-Abor silty clays, 8 to 25 percent slopes-----	0	33,750	33,750	1.0
143	Neldore-Abor silty clays, 25 to 60 percent slopes-----	0	8,472	8,472	0.3
144	Neldore-Abor-Rock outcrop complex, 8 to 35 percent slopes-----	0	12,072	12,072	0.4
145	Neldore-Neldore, saline, silty clays, 4 to 15 percent slopes-----	0	21,449	21,449	0.6
146	Neldore-Rock outcrop complex, 15 to 60 percent slopes-----	0	15,350	15,350	0.5
147	Neldore-Ustic Torriorthents, strongly saline-Neldore, saline, complex, 2 to 25 percent slopes-----	0	39,173	39,173	1.2
148	Neldore-Volborg silty clays, 4 to 25 percent slopes-----	0	20,388	20,388	0.6
149	Neldore-Yawdim silty clays, 8 to 45 percent slopes-----	0	8,186	8,186	0.2
150	Niler silty clay loam, 4 to 35 percent slopes-----	0	13,762	13,762	0.4
151	Orinoco-Yawdim silty clay loams, 2 to 8 percent slopes-----	0	6,315	6,315	0.2
152	Rahworth loam, 2 to 8 percent slopes-----	0	4,066	4,066	0.1
153	Rahworth-Davidell-Sumatra complex, 2 to 8 percent slopes-----	0	12,087	12,087	0.4
154	Riverwash-----	0	2,011	2,011	0.1
155	Rock outcrop-----	0	3,057	3,057	0.1
156	Rominell fine sandy loam, 1 to 4 percent slopes, eroded-----	0	9,835	9,835	0.3
157	Sagedale silty clay loam, 4 to 15 percent slopes-----	431	331	762	*
158	Sagedale-Cabba-Wayden complex, 8 to 25 percent slopes-----	1,331	4,997	6,328	0.2
159	Savage silty clay loam, 0 to 2 percent slopes-----	347	0	347	*
160	Savage silty clay loam, 2 to 8 percent slopes-----	977	1,969	2,946	0.1
161	Shambo loam, 0 to 2 percent slopes-----	373	590	963	*
162	Shambo loam, 2 to 8 percent slopes-----	4,834	4,119	8,953	0.3
163	Shambo loam, 8 to 15 percent slopes-----	1,914	1,550	3,464	0.1
164	Shambo-Bitton-Cabba complex, 8 to 15 percent slopes-----	44	1,650	1,694	0.1
165	Shambo-Doney loams, 4 to 15 percent slopes-----	7,570	2,318	9,888	0.3
166	Shambo-Doney-Cabba loams, 8 to 35 percent slopes-----	17,755	5,631	23,386	0.7
167	Shambo-Doney-Sagedale complex, 8 to 35 percent slopes-----	4,307	772	5,079	0.2
168	Spang sandy loam, 2 to 8 percent slopes-----	0	710	710	*
169	Spang-Birney complex, 8 to 15 percent slopes-----	0	3,283	3,283	0.1
170	Spang, moist-Birney, moist-Birney complex, 8 to 25 percent slopes--	0	3,298	3,298	0.1

ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Big Horn County	Rosebud County	Total--	
				Area	Extent
		Acres	Acres	Acres	Pct
171	Spinekop silty clay loam, 0 to 2 percent slopes-----	0	6,597	6,597	0.2
172	Straw-Canburn, warm, loams, 0 to 2 percent slopes-----	1,226	693	1,919	0.1
173	Sumatra silty clay loam, 4 to 25 percent slopes-----	0	39,384	39,384	1.2
174	Sumatra-Rock outcrop complex, 4 to 35 percent slopes-----	0	11,494	11,494	0.3
175	Tinsley very gravelly sandy loam, 15 to 35 percent slopes-----	0	4,188	4,188	0.1
176	Tinsley-Armells-Yamac complex, 8 to 35 percent slopes-----	0	13,369	13,369	0.4
177	Tinsley-Cabbart complex, 15 to 45 percent slopes-----	0	6,838	6,838	0.2
178	Twilight-Blackhall, warm, fine sandy loams, 15 to 70 percent slopes-----	0	15,345	15,345	0.5
179	Twin Creek-Shambo loams, 2 to 8 percent slopes-----	625	1,619	2,244	0.1
180	Typic Haplaquepts, 0 to 2 percent slopes-----	38	495	533	*
181	Ustic Torrifluvents, 0 to 2 percent slopes, frequently flooded-----	0	4,244	4,244	0.1
182	Ustic Torrifluvents, saline, 0 to 2 percent slopes, frequently flooded-----	0	8,382	8,382	0.3
183	Ustic Torriorthents, 15 to 35 percent slopes-----	4,568	19,294	23,862	0.7
184	Ustic Torriorthents, loamy, 4 to 15 percent slopes-----	0	3,454	3,454	0.1
185	Ustic Torriorthents, moderately saline, 0 to 70 percent slopes-----	0	38,806	38,806	1.2
186	Ustic Torriorthents, strongly saline, 0 to 8 percent slopes-----	0	10,438	10,438	0.3
187	Ustic Torriorthents, clayey-Volborg, saline, complex, 1 to 8 percent slopes-----	0	1,760	1,760	0.1
188	Vaeda silty clay, 0 to 4 percent slopes-----	0	17,191	17,191	0.5
189	Vanda silty clay, 0 to 4 percent slopes-----	0	14,687	14,687	0.4
190	Vanstel loam, 2 to 8 percent slopes-----	0	33,240	33,240	1.0
191	Volborg silty clay, 8 to 35 percent slopes-----	0	17,035	17,035	0.5
192	Volborg silty clay, saline, 1 to 4 percent slopes-----	0	26,940	26,940	0.8
193	Volborg, saline-Rock outcrop complex, 4 to 45 percent slopes-----	0	13,651	13,651	0.4
194	Weingart clay, 2 to 8 percent slopes-----	0	3,193	3,193	0.1
195	Weingart-Neldore complex, 4 to 25 percent slopes-----	0	4,656	4,656	0.1
196	Weingart-Niler-Rock outcrop complex, dissected, 2 to 25 percent slopes-----	0	11,861	11,861	0.4
197	Yamac loam, 0 to 2 percent slopes-----	1,184	14,643	15,827	0.5
198	Yamac loam, 2 to 8 percent slopes-----	5,089	78,247	83,336	2.5
199	Yamac loam, 8 to 15 percent slopes-----	3,513	15,986	19,499	0.6
200	Yamac-Abor complex, 8 to 25 percent slopes-----	0	6,526	6,526	0.2
201	Yamac-Birney complex, 2 to 8 percent slopes-----	135	5,953	6,088	0.2
202	Yamac-Birney complex, 8 to 15 percent slopes-----	59	10,560	10,619	0.3
203	Yamac-Birney complex, 15 to 25 percent slopes-----	407	6,072	6,479	0.2
204	Yamac-Birney-Cabbart complex, 15 to 25 percent slopes-----	2,521	25,260	27,781	0.8
205	Yamac-Busby complex, 2 to 8 percent slopes-----	39	19,344	19,383	0.6
206	Yamac-Busby complex, 8 to 15 percent slopes-----	267	13,000	13,267	0.4
207	Yamac-Cabbart loams, 8 to 25 percent slopes-----	5,047	44,319	49,366	1.5
208	Yamac-Delpoint loams, 4 to 15 percent slopes-----	961	67,911	68,872	2.1
209	Yamac-Redcreek loams, 2 to 15 percent slopes-----	196	7,476	7,672	0.2
210	Yamac-Rominell, eroded, complex, 2 to 8 percent slopes-----	0	3,328	3,328	0.1
211	Yawdim silty clay loam, 2 to 8 percent slopes-----	0	3,670	3,670	0.1
212	Yawdim-Cabbart-Kobar complex, 15 to 70 percent slopes-----	0	6,119	6,119	0.2
213	Yawdim-Orinoco silty clay loams, 2 to 8 percent slopes-----	0	7,250	7,250	0.2
214	Zatoville silty clay loam, 1 to 4 percent slopes-----	0	5,757	5,757	0.2
215	Zatoville silty clay loam, loamy substratum, 0 to 2 percent slopes-----	0	1,539	1,539	*
216	Zatoville silty clay, moderately wet, 0 to 2 percent slopes-----	0	1,262	1,262	*
217	Zatoville-Orinoco silty clay loams, 2 to 8 percent slopes-----	0	10,237	10,237	0.3
DA	Denied access-----	0	111,664	111,664	3.4
W	Water-----	8	9,692	9,700	0.3
	Total-----	202,200	3,114,400	3,316,600	100.0

* Less than 0.05 percent.

Soil Series and Detailed Soil Map Units

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

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (7). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (6). Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

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

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus

they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. 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. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included 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 included 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. Havre loam, 0 to 2 percent slopes, is a phase of the Havre series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called complexes 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. Yamac-Birney complex, 2 to 8 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Havre, Harlem, and Glendive soils, channeled, 0 to 2 percent slopes, is an undifferentiated group in this survey area.

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

The 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.

Abor Series

The Abor series consists of moderately deep, well drained soils on sedimentary plains and hills. These soils formed in residuum derived from semiconsolidated shale. Slope is 2 to 45 percent. Elevation is 2,500 to 3,300 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 days.

Taxonomic Class: Fine, montmorillonitic, frigid Udorthentic Chromusterts

Typical Pedon

Abor silty clay, in an area of Abor-Marvan silty clays, 2 to 8 percent slopes; in an area of rangeland, 385 feet

west and 565 feet south of the northeast corner of sec. 27, T. 11 N., R. 33 E.

A1—0 to 1½ inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong fine granular structure; slightly hard, firm, sticky and plastic; many very fine roots; mildly alkaline; abrupt smooth boundary.

A2—1½ to 5 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium platy structure; hard, very firm, sticky and very plastic; many very fine roots; few vertical cracks up to 1 inch in width; slightly effervescent; moderately alkaline; clear smooth boundary.

Bss—5 to 16 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, very firm, sticky and very plastic; many very fine roots and pores; few slickensides; few vertical cracks up to 1 inch in width; slightly effervescent; moderately alkaline; clear wavy boundary.

Bssk—16 to 24 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak coarse angular blocky structure; extremely hard, very firm, sticky and very plastic; common very fine roots; many very fine pores; few slickensides; few vertical cracks up to 1 inch in width; few medium soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bky—24 to 30 inches; variegated grayish brown (2.5Y 5/2) and gray (10YR 5/1) silty clay, dark grayish brown (2.5Y 4/2) and dark gray (10YR 4/1) moist; massive; very hard, firm, sticky and plastic; few very fine roots; many very fine pores; 15 percent soft shale fragments; few fine soft masses of gypsum; weakly effervescent; mildly alkaline; clear wavy boundary.

Cr—30 to 60 inches; gray (10YR 5/1), semiconsolidated shale, dark gray (10YR 4/1) moist; few very fine flat roots in cracks; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F; 60 to 72 degrees F in the summer

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bssk horizon: 10 to 20 inches

Depth to bedrock: 20 to 40 inches

Note: These soils have cracks that extend to the

paralithic contact, are as wide as ¼ inch to 3 inches at the surface, and are open for 150 days or less.

A horizon

Hue: 10YR to 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 1 to 4; chroma of 1 inherited from the parent material
 Clay content: 40 to 55 percent
 Content of rock fragments: 0 to 25 percent—0 to 20 percent cobbles and stones more than 3 inches in size, 0 to 25 percent pebbles less than 3 inches in size
 Electrical conductivity: 0 to 4 mmhos/cm
 Reaction: pH 7.4 to 8.4

Bss horizon

Hue: 10YR to 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 1 to 4
 Texture: Silty clay, silty clay loam, or clay
 Clay content: 35 to 60 percent
 Content of rock fragments: 0 to 15 percent—0 to 3 percent cobbles and stones more than 3 inches in size, 0 to 12 percent pebbles less than 3 inches in size
 Electrical conductivity: 0 to 4 mmhos/cm
 Abundance of slickensides: Few or common
 Reaction: pH 7.4 to 9.0

Bssk horizon

Hue: 5Y to 10YR
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 1 to 4
 Texture: Silty clay, silty clay loam, clay loam, or clay
 Clay content: 35 to 60 percent
 Abundance of slickensides: Few or common
 Structure: Weak medium, moderate medium, or weak coarse blocky
 Content of rock fragments: 0 to 20 percent—0 to 5 percent cobbles and stones more than 3 inches in size, 0 to 15 percent pebbles less than 3 inches in size
 Electrical conductivity: 0 to 4 mmhos/cm
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0
 Other features: A Bssky horizon in some pedons

Bky horizon

Hue: 5Y to 10YR
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 1 to 4
 Texture: Silty clay, silty clay loam, or clay
 Clay content: 35 to 60 percent
 Content of rock fragments: 0 to 20 percent—0 to 5 percent cobbles and stones more than 3 inches

in size, 0 to 15 percent pebbles less than 3 inches in size

Electrical conductivity: 0 to 4 mmhos/cm
 Content of gypsum: 1 to 5 percent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 9.0
 Other features: A By horizon in some pedons

1—Abor silty clay, 2 to 8 percent slopes

Composition

Abor and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Elevation: 2,500 to 3,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

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

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

Inclusions

- Neldore soils on shoulders
- Gerdrum soils on foot slopes
- Marvan soils on foot slopes
- Vaeda soils on foot slopes

Management

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

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

2—Abor silty clay, 8 to 15 percent slopes

Composition

Abor and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Hills
Slope: 8 to 15 percent
Elevation: 2,500 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

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

Inclusions

- Neldore soils on shoulders
- Gerdrum soils on foot slopes
- Marvan soils on foot slopes
- Vaeda soils on foot slopes

Management

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

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

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

Composition

Abor and similar soils: 45 percent
Marvan and similar soils: 40 percent
Inclusions: 15 percent

Setting

Landform:
• Abor—Sedimentary plains
• Marvan—Sedimentary plains
Position on landform:
• Abor—Back slopes and shoulders
• Marvan—Foot slopes
Slope:
• Abor—2 to 8 percent
• Marvan—2 to 8 percent
Elevation: 2,800 to 3,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Abor

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.6 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
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 6.8 inches

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

Inclusions

- Neldore soils on shoulders
- Vaeda soils in drainageways

Management

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

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

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

Composition

Abor and similar soils: 55 percent
Neldore and similar soils: 30 percent
Inclusions: 15 percent

Setting

Landform:

- Abor—Hills
- Neldore—Hills

Position on landform:

- Abor—Foot slopes
- Neldore—Back slopes and shoulders

Slope:

- Abor—4 to 15 percent
- Neldore—4 to 15 percent

Elevation: 2,600 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Abor

Surface layer texture: Silty clay

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Marvan soils on foot slopes
- Vaeda soils on foot slopes

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

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

Absher Series

The Absher series consists of very deep, moderately well drained soils on stream terraces and alluvial fans. These soils formed in alluvium. Slope is 0 to 4 percent. Elevation is 2,500 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic Borollic Natrargids

Typical Pedon

Absher silty clay, in an area of Absher-Nobe complex, 0 to 4 percent slopes; in an area of rangeland, 1,600 feet west and 2,300 feet south of the northeast corner of sec. 13, T. 9 N., R. 39 E.

E—0 to 2 inches; light gray (2.5Y 7/2) loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure; soft, friable, nonsticky and slightly plastic; many very fine roots; mildly alkaline; abrupt smooth boundary.

Btn1—2 to 7 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium columnar structure parting to strong fine and medium angular blocky; very hard, firm, sticky and plastic; many very fine roots; common very fine pores; continuous moderately thick clay films on faces of peds; mildly alkaline; abrupt smooth boundary.

Btn2—7 to 13 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, firm, sticky and plastic; many very fine roots; common very fine tubular pores; few thin clay films on vertical faces of peds; moderately alkaline; abrupt smooth boundary.

Bkz—13 to 30 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine pores; common fine soft masses of gypsum and other salts; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Cz1—30 to 50 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, slightly sticky and plastic; few very fine roots; common very fine pores; few fine soft masses of salt; strongly effervescent; strongly alkaline; clear smooth boundary.

Cz2—50 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; few very fine roots; common medium threads of salt; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F; 60 to 68 degrees F in the summer

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

E horizon

Hue: 2.5Y to 7.5YR

Value: 6 or 7 dry; 3 to 5 moist

Chroma: 1 to 3

Clay content: 15 to 27 percent

Content of rock fragments: 0 to 30 percent pebbles, 0 to 5 percent cobbles

Electrical conductivity: 4 to 8 mmhos/cm

Reaction: pH 6.6 to 8.4

Btn horizon

Hue: 2.5Y to 7.5YR

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 1 to 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

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 18 to 70

Reaction: pH 6.6 to 9.0

Bkyz horizon

Hue: 2.5Y to 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 35 to 50 percent

Content of 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

Content of gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

Cz horizon

Hue: 2.5Y to 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 35 to 50 percent

Content of 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

Content of gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

5—Absher-Nobe complex, 0 to 4 percent slopes

Composition

Absher and similar soils: 55 percent

Nobe and similar soils: 30 percent

Inclusions: 15 percent

Setting

Landform:

- Absher—Alluvial fans and stream terraces
- Nobe—Alluvial fans and stream terraces

Position on landform:

- Absher—Microlows
- Nobe—Microhighs

Slope:

- Absher—0 to 4 percent
- Nobe—0 to 4 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Absher

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 4.2 inches

Nobe

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Moderately well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodicy within a depth of 30 inches

Available water capacity: Mainly 4.5 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Brunelda and similar soils
- Marvan and similar soils
- Vanda and similar soils

Management

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

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

Alona Series

The Alona series consists of very deep, well drained soils on alluvial fans and stream terraces. These soils formed in alluvium. Slope is 0 to 8 percent. Elevation is 2,700 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is about 115 to 130 days.

Taxonomic Class: Fine-silty, mixed Borollic Camborthids

Typical Pedon

Alona silt loam, in an area of Lonna-Alona silt loams, 0 to 2 percent slopes; in an area of rangeland, 400 feet west and 1,200 feet north of the southeast corner of sec. 2, T. 10 N., R. 44 E.

A1—0 to 2 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak thin platy structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots and pores; slightly effervescent; moderately alkaline; clear smooth boundary.

A2—2 to 8 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure parting to weak thin platy; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; slightly

effervescent; moderately alkaline; abrupt smooth boundary.

Bw—8 to 14 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 medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; strongly effervescent; very strongly alkaline; clear smooth boundary.

Bk—14 to 21 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium subangular blocky structure parting to moderate thin platy; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; common fine soft masses of lime; strongly effervescent; very strongly alkaline; clear smooth boundary.

Bkz—21 to 44 inches; light brownish gray (2.5Y 6/2) silty clay loam, brownish gray (2.5Y 5/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; common fine soft masses of lime and salts; strongly effervescent; very strongly alkaline; clear smooth boundary.

Cz—44 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine seams and threads of salts; strongly effervescent; very strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 6 to 18 inches

Note: If these soils are cultivated, a vesicular crust 1/2 to 1 inch thick may form on the surface after a rain.

A horizon

Hue: 10YR to 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Effervescence: None to strong

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 2 to 10

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR to 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam
 Clay content: 25 to 35 percent
 Effervescence: None to violent
 Electrical conductivity: 2 to 16 mmhos/cm
 Sodium adsorption ratio: 1 to 13
 Calcium carbonate equivalent: 0 to 10 percent
 Reaction: pH 7.9 to 9.6

Bk horizon

Hue: 10YR to 5Y
 Value: 6 or 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Silt loam or silty clay loam
 Clay content: 18 to 35 percent
 Effervescence: Strong or violent
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 2 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 40
 Reaction: pH 8.4 to 9.6

Bkz horizon

Hue: 10YR to 5Y
 Value: 6 or 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loam, silty clay loam, or silt loam
 Clay content: 18 to 35 percent
 Effervescence: Strong or violent
 Calcium carbonate equivalent: 5 to 15 percent
 Electrical conductivity: 8 to 20 mmhos/cm
 Sodium adsorption ratio: 13 to 40
 Reaction: pH 8.4 to 9.6

Cz horizon

Hue: 10YR to 5Y
 Value: 6 or 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Loam, silty clay loam, or silt loam
 Clay content: 18 to 35 percent
 Effervescence: Strong or violent
 Electrical conductivity: 8 to 20 mmhos/cm
 Sodium adsorption ratio: 13 to 46
 Reaction: pH 8.4 to 9.6

Antwerp Series

The Antwerp series consists of very deep, well drained soils on alluvial fans and stream terraces. These soils formed in alluvium. Slope is 0 to 4 percent. Elevation is 2,600 to 3,200 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed (calcareous), frigid Ustic Torriorthents

Typical Pedon

Antwerp silty clay loam, 0 to 4 percent slopes, in an

area of rangeland, 600 feet north and 30 feet west of the southeast corner of sec. 28, T. 9 N., R. 40 E.

- E—0 to 1 inch; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; vesicular crust; slightly hard, friable, slightly sticky and plastic; common fine and very fine roots; common very fine pores; strongly alkaline; abrupt smooth boundary.
- Bw—1 to 6 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure; hard, friable, sticky and plastic; common fine and very fine roots; common very fine pores; strongly effervescent; very strongly alkaline; abrupt smooth boundary.
- Bz1—6 to 15 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure; hard, friable, sticky and plastic; few very fine roots and pores; many fine masses of salt; strongly effervescent; strongly alkaline; clear smooth boundary.
- Bz2—15 to 24 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; weak fine granular structure; slightly hard, friable, slightly sticky and plastic; few very fine roots and pores; common medium masses of salt; strongly effervescent; moderately alkaline; gradual irregular boundary.
- BC—24 to 60 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

E horizon

Hue: 2.5Y or 10YR
 Value: 6 or 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Clay content: 27 to 33 percent
 Electrical conductivity: Less than 2 mmhos/cm
 Reaction: pH 7.9 to 9.0

Bw horizon

Hue: 2.5Y or 10YR
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: Silty clay loam or silt loam
 Clay content: 27 to 35 percent
 Calcium carbonate equivalent: 5 to 10 percent
 Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 30
Reaction: pH 7.9 to 9.6

Bz horizon

Hue: 2.5Y or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Silty clay loam or silt loam
Clay content: 20 to 35 percent
Calcium carbonate equivalent: 5 to 10 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 15 to 40
Reaction: pH 7.9 to 9.0

BC horizon

Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Silt loam or silty clay loam
Clay content: 20 to 35 percent
Calcium carbonate equivalent: 5 to 10 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 15 to 30
Reaction: pH 7.9 to 9.0

6—Antwerp silty clay loam, 0 to 4 percent slopes

Composition

Antwerp and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 2,700 to 3,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

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

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

Inclusions

- Davidell and similar soils
- Vanda and similar soils

Management

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

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

Armells Series

The Armells series consists of very deep, well drained soils on foot slopes and side slopes on relict stream terraces and hills. These soils formed in alluvium and in colluvium derived from baked sandstone and shale. Slope is 25 to 70 percent. Elevation is 2,500 to 4,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Loamy-skeletal, mixed (calcareous), frigid Ustic Torriorthents

Typical Pedon

Armells channery loam, in an area of Armells-Kirby complex, 25 to 70 percent slopes; in an area of rangeland, 2,000 feet east and 400 feet south of the northwest corner of sec. 8, T. 4 S., R. 44 E.

A—0 to 4 inches; reddish brown (5YR 5/3) channery loam, dark reddish brown (5YR 3/3) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; 30 percent hard channers; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk1—4 to 18 inches; reddish brown (5YR 5/3) extremely channery loam, reddish brown (5YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; common very fine roots matted around rock fragments; 60 percent channers and 5 percent flagstones; many moderately thick lime coatings on the lower surfaces of coarse fragments; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—18 to 30 inches; reddish brown (2.5YR 5/4) extremely channery loam, red (2.5YR 4/6) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; 60 percent channers

and 5 percent flagstones; common thin lime coatings on the lower surfaces of coarse fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk3—30 to 60 inches; red (2.5YR 5/6) extremely channery loam, red (2.5YR 4/6) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; 60 percent channers and 5 percent flagstones; common thin lime coatings on the lower sides of coarse fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 3 to 7 inches

Note: When mixed to a depth of 7 inches, the surface layer does not meet the requirements for a mollic epipedon.

A horizon

Hue: 2.5YR to 7.5YR

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 10 to 22 percent

Content of rock fragments: 15 to 45 percent—0 to 15 percent flagstones, 5 to 30 percent channers

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Bk1 and Bk2 horizons

Hue: 2.5YR to 7.5YR

Value: 4 to 7 dry; 3 to 5 moist

Chroma: 3 to 6

Texture: Loam or fine sandy loam

Clay content: 18 to 27 percent

Content of rock fragments: 35 to 80 percent—0 to 10 percent flagstones, 35 to 70 percent channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

Bk3 horizon

Hue: 2.5YR to 10YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 3 to 6

Texture: Loam or fine sandy loam

Clay content: 15 to 27 percent

Content of rock fragments: 35 to 80 percent—0 to 10 percent flagstones, 35 to 70 percent channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

7—Armells-Cabbart complex, 25 to 70 percent slopes

Composition

Armells and similar soils: 50 percent

Cabbart and similar soils: 25 percent

Inclusions: 25 percent

Setting

Landform:

- Armells—Hills
- Cabbart—Hills

Position on landform:

- Armells—Back slopes and foot slopes
- Cabbart—Shoulders and summits

Slope:

- Armells—25 to 70 percent
- Cabbart—25 to 70 percent

Elevation: 3,100 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Armells

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Busby soils on foot slopes
- Yamac soils on foot slopes
- Yawdim soils on back slopes
- Areas of rock outcrop

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

8—Armells-Delpoint-Cabbart complex, 25 to 70 percent slopes

Composition

Armells and similar soils: 40 percent
 Delpoint and similar soils: 20 percent
 Cabbart and similar soils: 20 percent
 Inclusions: 20 percent

Setting

Landform:

- Armells—Hills
- Delpoint—Hills
- Cabbart—Hills

Position on landform:

- Armells—Foot slopes
- Delpoint—Back slopes and foot slopes
- Cabbart—Shoulders and summits

Slope:

- Armells—25 to 70 percent
- Delpoint—25 to 70 percent
- Cabbart—25 to 70 percent

Elevation: 2,800 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Armells

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.8 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Busby soils on foot slopes
- Yamac soils on foot slopes
- Yawdim soils on back slopes
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

9—Armells-Kirby complex, 25 to 70 percent slopes

Composition

Armells and similar soils: 50 percent

Kirby and similar soils: 30 percent

Inclusions: 20 percent

Setting

Landform:

- Armells—Hills
- Kirby—Hills

Position on landform:

- Armells—Back slopes and foot slopes
- Kirby—Back slopes and shoulders

Slope:

- Armells—25 to 70 percent
- Kirby—25 to 70 percent

Elevation: 3,100 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Armells

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Kirby

Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Material weathered from baked sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.1 inches

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

Inclusions

- Cabbart soils on back slopes
- Yawdim soils on back slopes
- Coopers soils on foot slopes
- Spang soils on foot slopes
- Areas of rock outcrop

Management

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

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

10—Armells-Kirby-Cabbart complex, 25 to 70 percent slopes

Composition

Armells and similar soils: 40 percent
 Kirby and similar soils: 20 percent
 Cabbart and similar soils: 20 percent
 Inclusions: 20 percent

Setting

Landform:

- Armells—Hills
- Kirby—Hills
- Cabbart—Hills

Position on landform:

- Armells—Back slopes and foot slopes
- Kirby—Shoulders and summits
- Cabbart—Back slopes and foot slopes

Slope:

- Armells—25 to 70 percent
- Kirby—25 to 70 percent
- Cabbart—25 to 70 percent

Elevation: 3,000 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Armells

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Kirby

Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Material weathered from baked sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.0 inches

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

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

Inclusions

- Spang soils on foot slopes
- Yamac soils on foot slopes

- Yawdim soils on back slopes
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Assinniboine Series

The Assinniboine series consists of very deep, well drained soils on alluvial fans. These soils formed in alluvium. Slope is 2 to 8 percent. Elevation is 2,600 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Assinniboine fine sandy loam, 2 to 8 percent slopes, in an area of grassland that was previously cultivated, 2,000 feet south and 700 feet west of the northeast corner of sec. 7, T. 8 N., R. 40 E.

- Ap—0 to 7 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many fine and very fine roots; neutral; abrupt smooth boundary.
- Bt1—7 to 11 inches; yellowish brown (10YR 5/4) sandy clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; few thin dark brown (10YR 4/3 moist) clay films on vertical faces of peds; mildly alkaline; abrupt smooth boundary.
- Bt2—11 to 16 inches; yellowish brown (10YR 5/4) sandy clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; mildly alkaline; abrupt smooth boundary.
- Bk—16 to 24 inches; light brownish gray (2.5Y 6/2) sandy clay loam, grayish brown (2.5Y 5/2) moist; weak medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; disseminated lime; strongly effervescent; mildly alkaline; clear smooth boundary.

BCK—24 to 40 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and nonplastic; few very fine roots; many very fine pores; few soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

BC—40 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, brownish gray (2.5Y 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in some parts more than 60 percent of the time from the middle of July through the middle of September

Mollic epipedon thickness: 7 to 16 inches, which includes all or part of the Bt horizon

Depth to the Bk horizon: 10 to 25 inches

Ap horizon

Hue: 10YR or 2.5Y

Chroma: 2 or 3

Content of rock fragments: 0 to 25 percent pebbles

Clay content: 5 to 15 percent

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Sandy clay loam or fine sandy loam

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 2.5Y or 10YR

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 10 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Other features: A Btk horizon in some pedons

BCK and BC horizons

Hue: 2.5Y or 10YR

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Fine sandy loam, sandy loam, loamy fine sand, or fine sand or strata of those textures

Clay content: 0 to 15 percent

Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 7.4 to 8.4

11—Assinniboine fine sandy loam, 2 to 8 percent slopes

Composition

Assinniboine and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 2,600 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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 8.5 inches

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

Inclusions

- Chinook and similar soils
- Evanston and similar soils
- Vanstel and similar soils

Management

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

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

12—Badland

Composition

Badland: 85 percent
Inclusions: 15 percent

Component Description

Definition: Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Geologic erosion is active.

Flooding: None

Inclusions

- Cabbart and similar soils
- Neldore and similar soils
- Ralrod and similar soils
- Soils that support vegetation; in drainageways

Barvon Series

The Barvon series consists of moderately deep, well drained soils on hills. These soils formed in semiconsolidated, sandy or loamy sedimentary beds. Slope is 15 to 60 percent. Elevation is 3,300 to 4,500 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 43 degrees F, and the frost-free period is 100 to 115 days.

Taxonomic Class: Fine-loamy, mixed Entic Haploborolls

Typical Pedon

Barvon loam, in an area of Barvon-Lamedeer-Lamedeer, dry, complex, 35 to 70 percent slopes; in an area of woodland, 2,300 feet west and 2,000 feet south of the northeast corner of sec. 20, T. 2 S., R. 42 E.

- Oi—2 inches to 0; pine needles and other plant litter.
A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and slightly plastic; many fine and medium roots; neutral; clear smooth boundary.
Bw—5 to 8 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots; 5 percent hard angular pebbles; mildly alkaline; clear smooth boundary.
Bk1—8 to 13 inches; pale brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few coarse roots and many fine and medium roots; 5 percent hard angular pebbles; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.
Bk2—13 to 28 inches; light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few coarse

roots and many fine and medium roots; 10 percent hard angular pebbles that have thin lime coatings on all sides; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—28 to 60 inches; pale yellow (2.5Y 8/4), semiconsolidated, sandy sedimentary beds that crush to loamy fine sand, pale yellow (2.5Y 7/4) moist; hard, friable, nonsticky and nonplastic; few fine roots along fracture planes; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Mollic epipedon thickness: 7 to 16 inches

Depth to bedrock: 20 to 40 inches

Depth to Bk horizon: 7 to 16 inches

A horizon

Hue: 10YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 20 to 30 percent

Content of rock fragments: 0 to 10 percent flat, angular pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Cr horizon

Hue: 10YR to 5Y

Value: 6 to 8 dry; 5 to 7 moist

Chroma: 2 to 6

Texture: Semiconsolidated, sandy or loamy sedimentary beds

13—Barvon-Lamedeer-Lamedeer, dry, complex, 35 to 70 percent slopes

Composition

Barvon and similar soils: 30 percent

Lamedeer and similar soils: 25 percent

Lamedeer, dry, and similar soils: 25 percent
Inclusions: 20 percent

Setting

Landform:

- Barvon—Hills
- Lamedeer—Hills
- Lamedeer, dry—Hills

Position on landform:

- Barvon—Back slopes
- Lamedeer—Back slopes
- Lamedeer, dry—Back slopes and foot slopes

Slope:

- Barvon—35 to 60 percent, north aspect
- Lamedeer—35 to 70 percent, north aspect
- Lamedeer, dry—35 to 70 percent, south aspect

Elevation: 3,800 to 4,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Barvon

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.5 inches

Lamedeer

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.5 inches

Lamedeer, dry

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.3 inches

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

Inclusions

- Very deep, loamy soils
- Ringling soils on summits
- Areas of rock outcrop

Management

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

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

14—Barvon, dry-Doney-Cabba complex, 15 to 70 percent slopes

Composition

Barvon and similar soils: 30 percent
Doney and similar soils: 25 percent
Cabba and similar soils: 25 percent
Inclusions: 20 percent

Setting

Landform:

- Barvon—Hills
- Doney—Hills
- Cabba—Hills

Position on landform:

- Barvon—Back slopes
- Doney—Back slopes
- Cabba—Back slopes and shoulders

Slope:

- Barvon—15 to 60 percent, north aspect
- Doney—15 to 70 percent, south aspect
- Cabba—15 to 70 percent

Elevation: 3,300 to 4,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Barvon

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.8 inches

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

Cabba

Surface layer texture: Silt loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.5 inches

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

Inclusions

- Bitton soils on foot slopes
- Shambo soils on foot slopes
- Kirby soils on summits
- Lamedeer, dry, soils
- Wayden soils on back slopes
- Areas of rock outcrop

Management

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

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

Belfield Series

The Belfield series consists of very deep, well drained soils on sedimentary plains and alluvial fans. These soils formed in alluvium. Slope is 0 to 4 percent. Elevation is 3,300 to 4,200 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 43 degrees F, and the frost-free period is 105 to 120 days.

Taxonomic Class: Fine, montmorillonitic Glossic Natriborolls

Typical Pedon

Belfield clay loam, 0 to 4 percent slopes, in an area of rangeland, 800 feet south and 600 feet east of the northwest corner of sec. 35, T. 3 S., R. 38 E.

A1—0 to 2 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy structure; soft, friable, nonsticky and nonplastic; many very fine roots; neutral; clear wavy boundary.

A2—2 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; silt and sand grains coating peds; neutral; clear wavy boundary.

E/B—5 to 7 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 subangular blocky; hard, friable, sticky and plastic; many very fine roots and pores; many clear (10YR 6/2) silt and sand grains coating peds; neutral; clear wavy boundary.

Bt1—7 to 11 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure parting to strong fine subangular blocky; hard, friable, sticky and very plastic; many very fine roots; many fine and very fine pores; many thin clay films on faces of peds and in pores; mildly alkaline; gradual wavy boundary.

Bt2—11 to 16 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and very plastic; common very fine roots and pores; continuous thin clay films on faces of peds and in pores; mildly alkaline; clear wavy boundary.

Bk—16 to 28 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate medium and fine subangular blocky structure; hard, firm, sticky and very plastic; common very fine roots and pores; few threads of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

Cy—28 to 36 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and very plastic; few very fine roots and pores; few nests of gypsum crystals; strongly effervescent; strongly alkaline; abrupt smooth boundary.

2Ck—36 to 42 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and slightly plastic; few very fine roots and pores; common fine masses and threads of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

3C—42 to 60 inches; light brownish gray (2.5Y 6/2) loam that has thin strata of fine sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Mollic epipedon thickness: 7 to 16 inches

Depth to Bk horizon: 15 to 55 inches

A horizon

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Reaction: pH 6.1 to 7.3

E/B horizon

Hue: 10YR or 2.5Y

Value: 3 to 7 dry; 2 to 5 moist

Chroma: 1 to 3

Clay content: 27 to 35 percent

Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 3 to 7 dry; 2 to 5 moist

Chroma: 2 to 4

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

Clay content: 35 to 45 percent

Sodium adsorption ratio: 13 to 20

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 5Y or 2.5Y

Value: 5 to 8 dry; 4 to 7 moist

Chroma: 1 to 4

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

Clay content: 27 to 45 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 20

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

C horizons

Hue: 2.5Y or 5Y

Value: 5 to 8 dry; 4 to 7 moist

Chroma: 1 to 4

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

Clay content: 27 to 45 percent

Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 13 to 20
 Reaction: pH 7.9 to 9.0

15—Belfield clay loam, 0 to 4 percent slopes

Composition

Belfield and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans
Slope: 0 to 4 percent
Elevation: 3,300 to 4,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 105 to 120 days

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 9.2 inches

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

Inclusions

- Savage and similar soils
- Salt-affected soils on microlows

Management

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

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

Birney Series

The Birney series consists of very deep, well drained soils on sedimentary plains, alluvial fans, and hills. These soils formed in colluvium derived from baked sandstone and shale. Slope is 2 to 70 percent. Elevation is 2,500 to 4,100 feet. The average annual

precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Loamy-skeletal, mixed Borollic Camborthids

Typical Pedon

Birney channery loam, in an area of Birney-Cooers-Kirby complex, 2 to 15 percent slopes; in an area of rangeland, 2,250 feet east and 550 feet north of the southwest corner of sec. 14, T. 3 S., R. 44 E.

A—0 to 5 inches; reddish brown (5YR 5/4) channery loam, reddish brown (5YR 4/4) moist; weak thick platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; 15 percent channers; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw—5 to 11 inches; reddish brown (5YR 5/3) channery loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine roots; common fine tubular pores; 20 percent channers; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—11 to 29 inches; light reddish brown (5YR 6/4) extremely channery sandy loam, reddish brown (5YR 5/4) moist; massive; soft, very friable, slightly sticky and nonplastic; common fine roots matted around coarse fragments; 50 percent channers and 15 percent flagstones; thin lime casts on the lower surfaces of coarse fragments; violently effervescent; strongly alkaline; gradual wavy boundary.

C—29 to 60 inches; reddish yellow (5YR 6/6) extremely channery sandy loam, red (2.5YR 6/6) moist; massive; soft, very friable, slightly sticky and nonplastic; few very fine roots; 45 percent channers and 20 percent flagstones; thin lime casts on the lower sides of coarse fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 8 and 24 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 10 to 15 inches

A horizon

Hue: 2.5YR to 10YR

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 10 to 25 percent

Content of rock fragments: 0 to 35 percent
channers
Effervescence: Slight or strong
Calcium carbonate equivalent: 1 to 10 percent
Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 2.5YR to 10YR
Value: 4 to 6 dry; 4 or 5 moist
Chroma: 3 to 6
Texture: Loam or sandy loam
Clay content: 10 to 25 percent
Content of rock fragments: 15 to 35 percent
channers or pebbles
Effervescence: Slight or strong
Calcium carbonate equivalent: 1 to 10 percent
Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 2.5YR to 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 6
Texture: Loam, sandy loam, or fine sandy loam
Clay content: 10 to 18 percent
Content of rock fragments: 50 to 80 percent—0 to
20 percent flagstones, 50 to 60 percent
channers or pebbles
Effervescence: Strong or violent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

C horizon

Hue: 2.5YR to 10YR
Value: 5 or 6 dry; 4 to 6 moist
Chroma: 2 to 6
Texture: Loam, sandy loam, or fine sandy loam
Clay content: 10 to 18 percent
Content of rock fragments: 45 to 80 percent—0 to
20 percent flagstones, 45 to 60 percent
channers or pebbles
Effervescence: Strong or violent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

16—Birney channery loam, 15 to 25 percent slopes**Composition**

Birney and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Hills
Slope: 15 to 25 percent
Elevation: 2,500 to 3,500 feet
Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

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

Inclusions

- Cabbart soils on back slopes
- Busby soils on foot slopes
- Tinsley soils on summits

Management

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

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

17—Birney-Cabbart complex, moist, 25 to 70 percent slopes**Composition**

Birney and similar soils: 50 percent
Cabbart and similar soils: 30 percent
Inclusions: 20 percent

Setting

Landform:
• Birney—Hills
• Cabbart—Hills
Position on landform:
• Birney—Back slopes and foot slopes
• Cabbart—Back slopes and shoulders
Slope:
• Birney—25 to 70 percent
• Cabbart—25 to 70 percent
Elevation: 3,000 to 4,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Birney

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.2 inches

Cabbart

Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 2.1 inches

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

Inclusions

- Armells soils on south aspects
- Delpoint, moist, soils
- Shallow soils that have a surface layer of silty clay loam
- Shallow soils that have a surface layer of sandy loam
- Areas of rock outcrop

Management

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

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

18—Birney-Cooers-Kirby complex, 2 to 15 percent slopes

Composition

Birney and similar soils: 35 percent
 Cooers and similar soils: 30 percent
 Kirby and similar soils: 20 percent
 Inclusions: 15 percent

Setting

Landform:

- Birney—Hills
- Cooers—Hills
- Kirby—Hills

Position on landform:

- Birney—Back slopes
- Cooers—Back slopes and foot slopes
- Kirby—Shoulders and summits

Slope:

- Birney—2 to 15 percent
- Cooers—2 to 8 percent
- Kirby—4 to 15 percent

Elevation: 3,100 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Birney

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

Cooers

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 9.6 inches

Kirby

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Material weathered from baked sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.6 inches

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

Inclusions

- Spang soils on foot slopes
- Yamac soils on foot slopes
- Areas of rock outcrop
- Kirby stony loam

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

19—Birney-Kirby channery loams, 4 to 25 percent slopes

Composition

Birney and similar soils: 50 percent
Kirby and similar soils: 30 percent
Inclusions: 20 percent

Setting

Landform:

- Birney—Hills
- Kirby—Hills

Position on landform:

- Birney—Back slopes and foot slopes
- Kirby—Shoulders and summits

Slope:

- Birney—4 to 25 percent
- Kirby—4 to 25 percent

Elevation: 3,100 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Birney

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

Kirby

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.6 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Coopers soils on foot slopes
- Spang soils on foot slopes
- Areas of rock outcrop
- Kirby stony loam

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

20—Birney-Kirby-Cabbart complex, 15 to 25 percent slopes

Composition

Birney and similar soils: 40 percent
Kirby and similar soils: 20 percent
Cabbart and similar soils: 20 percent
Inclusions: 20 percent

Setting

Landform:

- Birney—Hills
- Kirby—Hills
- Cabbart—Hills

Position on landform:

- Birney—Back slopes and foot slopes
- Kirby—Shoulders and summits
- Cabbart—Back slopes and shoulders

Slope:

- Birney—15 to 25 percent
- Kirby—15 to 25 percent
- Cabbart—15 to 25 percent

Elevation: 3,000 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Birney

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.1 inches

Kirby

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Delpoint soils on back slopes
- Yawdim soils on back slopes
- Spang soils on foot slopes
- Yamac soils on foot slopes
- Areas of rock outcrop
- Kirby stony loam

Management

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

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

21—Birney, moist-Armells-Cabbart complex, 25 to 70 percent slopes

Composition

Birney and similar soils: 50 percent

Armells and similar soils: 15 percent

Cabbart and similar soils: 15 percent

Inclusions: 20 percent

Setting

Landform:

- Birney—Hills
- Armells—Hills
- Cabbart—Hills

Position on landform:

- Birney—Back slopes and foot slopes
- Armells—Back slopes and foot slopes
- Cabbart—Back slopes and shoulders

Slope:

- Birney—25 to 70 percent, north aspect
- Armells—25 to 70 percent, south aspect
- Cabbart—25 to 70 percent

Elevation: 3,000 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Birney

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.1 inches

Armells

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.1 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Delpoint soils on back slopes
- Yawdim soils on back slopes
- Kirby soils on summits

- Coopers soils on foot slopes
- Spang soils on foot slopes
- Areas of rock outcrop

Management

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

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

22—Birney, moist-Birney-Kirby channery loams, 15 to 25 percent slopes

Composition

Birney, moist, and similar soils: 45 percent
 Birney and similar soils: 25 percent
 Kirby and similar soils: 15 percent
 Inclusions: 15 percent

Setting

Landform:

- Birney, moist—Hills
- Birney—Hills
- Kirby—Hills

Position on landform:

- Birney, moist—Back slopes
- Birney—Back slopes
- Kirby—Shoulders and summits

Slope:

- Birney, moist—15 to 25 percent, north aspect
- Birney—15 to 25 percent, south aspect
- Kirby—15 to 25 percent

Elevation: 3,100 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Birney, moist

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.4 inches

Birney

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.1 inches

Kirby

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Flooding: None

Available water capacity: Mainly 1.2 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Cabbart soils on back slopes
- Coopers soils on foot slopes
- Spang soils on foot slopes
- Areas of rock outcrop
- Kirby soils that have boulders

Management

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

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

Bitton Series

The Bitton series consists of very deep, well drained soils on sedimentary plains, alluvial fans, and hills.

These soils formed in colluvium derived from baked sandstone and shale. Slope is 2 to 70 percent.

Elevation is 3,000 to 4,500 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 120 days.

Taxonomic Class: Loamy-skeletal, mixed Typic Haploborolls

Typical Pedon

Bitton channery loam, in an area of Bitton, moist-Lamedeer, dry-Ringling, dry, channery loams, 25 to 70 percent slopes; in an area of woodland, 1,400 feet north

and 1,100 feet east of the southwest corner of sec. 25, T. 2 S., R. 41 E.

A—0 to 5 inches; brown (7.5YR 5/2) channery loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 15 percent channers; mildly alkaline; clear smooth boundary.

Bw—5 to 13 inches; pale brown (10YR 6/3) channery loam, brown (10YR 4/3) moist; massive; soft, friable, nonsticky and nonplastic; many very fine roots and pores; 30 percent channers; few thin lime casts on undersides of pebbles; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk—13 to 28 inches; pinkish gray (7.5YR 7/2) very channery loam, brown (7.5YR 5/2) moist; massive; soft, friable, nonsticky and nonplastic; many very fine roots; 55 percent channers; thin lime casts and coatings on all sides of coarse fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

BCK—28 to 60 inches; pale brown (10YR 6/3) extremely channery loam, dark grayish brown (10YR 4/2) moist; massive; soft, friable, nonsticky and nonplastic; common very fine roots; 60 percent channers; common thin lime casts on undersides of coarse fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 11 to 28 inches

A horizon

Hue: 2.5Y to 5YR

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 12 to 27 percent

Content of rock fragments: 0 to 45 percent—0 to 20 percent stones and cobbles, 5 to 45 percent channers and pebbles

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 2.5Y to 5YR

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 12 to 27 percent

Content of rock fragments: 20 to 60 percent—0 to 10 percent stones and cobbles, 20 to 60 percent channers and pebbles

Reaction: pH 7.4 to 8.4

Bk and BCK horizons

Hue: 2.5Y to 5YR

Value: 5 to 8 dry; 5 to 8 moist

Chroma: 2 to 4

Texture: Loam or sandy loam

Clay content: 15 to 27 percent

Content of rock fragments: 35 to 75 percent—0 to 60 percent cobbles and stones, 35 to 60 percent pebbles and channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

23—Bitton-Doney-Ringling, dry, complex, 15 to 25 percent slopes

Composition

Bitton and similar soils: 35 percent

Doney and similar soils: 35 percent

Ringling and similar soils: 20 percent

Inclusions: 10 percent

Setting

Landform:

- Bitton—Hills

- Doney—Hills

- Ringling—Hills

Position on landform:

- Bitton—Back slopes and foot slopes

- Doney—Back slopes

- Ringling—Shoulders and summits

Slope:

- Bitton—15 to 25 percent

- Doney—15 to 25 percent

- Ringling—15 to 25 percent

Elevation: 3,500 to 4,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Bitton

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.1 inches

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.4 inches

Ringling

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.8 inches

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

Inclusions

- Cabba soils on back slopes
- Shambo soils on foot slopes
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

24—Bitton-Doney-Ringling, dry, complex, 25 to 70 percent slopes

Composition

Bitton and similar soils: 35 percent

Doney and similar soils: 30 percent

Ringling and similar soils: 20 percent

Inclusions: 15 percent

Setting

Landform:

- Bitton—Hills
- Doney—Hills
- Ringling—Hills

Position on landform:

- Bitton—Back slopes and foot slopes
- Doney—Back slopes
- Ringling—Shoulders and summits

Slope:

- Bitton—25 to 70 percent

- Doney—25 to 70 percent

- Ringling—25 to 70 percent

Elevation: 3,500 to 4,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Bitton

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.1 inches

Ringling

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.6 inches

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

Inclusions

- Cabba soils on back slopes
- Shambo soils on foot slopes
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

25—Bitton-Ringling, dry, channery loams, 8 to 25 percent slopes

Composition

Bitton and similar soils: 55 percent
 Ringling and similar soils: 30 percent
 Inclusions: 15 percent

Setting

Landform:

- Bitton—Hills
- Ringling—Hills

Position on landform:

- Bitton—Back slopes and foot slopes
- Ringling—Shoulders and summits

Slope:

- Bitton—8 to 25 percent
- Ringling—8 to 25 percent

Elevation: 3,300 to 4,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Bitton

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Ringling

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Material weathered from baked sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.7 inches

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

Inclusions

- Cabba soils on back slopes
- Shambo soils on foot slopes
- Twin Creek soils on fans
- Areas of rock outcrop

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

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

26—Bitton-Shambo complex, 4 to 15 percent slopes

Composition

Bitton and similar soils: 50 percent
 Shambo and similar soils: 35 percent
 Inclusions: 15 percent

Setting

Landform:

- Bitton—Hills
- Shambo—Hills

Slope:

- Bitton—4 to 15 percent
- Shambo—4 to 15 percent

Elevation: 3,600 to 4,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Bitton

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.1 inches

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 9.8 inches

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

Inclusions

- Savage soils on alluvial fans

- Areas of poorly drained soils
- Bitton stony loam

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

27—Bitton-Twin Creek complex, 2 to 8 percent slopes

Composition

Bitton and similar soils: 40 percent
Twin Creek and similar soils: 40 percent
Inclusions: 20 percent

Setting

Landform:

- Bitton—Sedimentary plains
- Twin Creek—Sedimentary plains

Position on landform:

- Bitton—Shoulders and summits
- Twin Creek—Back slopes

Slope:

- Bitton—2 to 8 percent
- Twin Creek—2 to 8 percent

Elevation: 3,300 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Bitton

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.1 inches

Twin Creek

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

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Ringling, dry, soils on summits
- Very deep soils that have a surface layer of sandy loam

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

28—Bitton-Twin Creek-Ringling, dry, complex, 2 to 15 percent slopes

Composition

Bitton and similar soils: 35 percent
Twin Creek and similar soils: 30 percent
Ringling and similar soils: 20 percent
Inclusions: 15 percent

Setting

Landform:

- Bitton—Hills
- Twin Creek—Hills
- Ringling—Hills

Position on landform:

- Bitton—Back slopes
- Twin Creek—Back slopes and foot slopes
- Ringling—Shoulders and summits

Slope:

- Bitton—2 to 15 percent
- Twin Creek—2 to 8 percent
- Ringling—4 to 15 percent

Elevation: 3,300 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Bitton

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

Twin Creek

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

Ringling

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

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

Inclusions

- Fergus variant soils
- Areas of rock outcrop
- Ringling soils that have boulders

Management

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

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

29—Bitton, moist-Doney-Cabba complex, 15 to 70 percent slopes

Composition

Bitton and similar soils: 30 percent

Doney and similar soils: 25 percent

Cabba and similar soils: 20 percent

Inclusions: 25 percent

Setting

Landform:

- Bitton—Hills

- Doney—Hills

- Cabba—Hills

Position on landform:

- Bitton—Back slopes and shoulders

- Doney—Back slopes

- Cabba—Back slopes

Slope:

- Bitton—15 to 70 percent

- Doney—15 to 70 percent

- Cabba—15 to 70 percent

Elevation: 3,000 to 4,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Bitton

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.9 inches

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

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

Inclusions

- Macar soils on foot slopes
- Kirby soils on summits
- Areas of rock outcrop

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

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

30—Bitton, moist-Lamedeer, dry-Ringling, dry, channery loams, 15 to 25 percent slopes

Composition

Bitton and similar soils: 40 percent
Lamedeer and similar soils: 30 percent
Ringling and similar soils: 15 percent
Inclusions: 15 percent

Setting

Landform:

- Bitton—Hills
- Lamedeer—Hills
- Ringling—Hills

Position on landform:

- Bitton—Back slopes and foot slopes
- Lamedeer—Back slopes and foot slopes
- Ringling—Shoulders and summits

Slope:

- Bitton—15 to 25 percent, south aspect
- Lamedeer—15 to 25 percent, north aspect
- Ringling—15 to 25 percent

Elevation: 3,000 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Bitton

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 5.3 inches

Lamedeer

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.4 inches

Ringling

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Flooding: None

Available water capacity: Mainly 1.3 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Barvon soils on back slopes
- Doney soils on back slopes
- Cabba soils on summits
- Very deep, loamy soils

Management

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

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

31—Bitton, moist-Lamedeer, dry-Ringling, dry, channery loams, 25 to 70 percent slopes

Composition

Bitton and similar soils: 50 percent
Lamedeer and similar soils: 20 percent
Ringling and similar soils: 15 percent
Inclusions: 15 percent

Setting

Landform:

- Bitton—Hills
- Lamedeer—Hills
- Ringling—Hills

Position on landform:

- Bitton—Back slopes and foot slopes
- Lamedeer—Back slopes and foot slopes
- Ringling—Shoulders and summits

Slope:

- Bitton—25 to 70 percent, south aspect

- Lamedeer—25 to 70 percent, north aspect
 - Ringling—25 to 70 percent
- Elevation:* 3,300 to 4,400 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 105 to 120 days

Component Description

Bitton

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 5.0 inches

Lamedeer

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.3 inches

Ringling

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Material weathered from baked sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.2 inches

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

Inclusions

- Cabba soils on summits
- Barvon soils on back slopes
- Doney soils on back slopes
- Shambo soils on foot slopes
- Areas of rock outcrop

Management

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

- "Range" section
- "Forest Land" section
- "Agronomy" section
- "Recreation" section

- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

32—Bitton, moist-Ringling, dry-Cabba complex, 25 to 70 percent slopes

Composition

Bitton and similar soils: 40 percent
 Ringling and similar soils: 20 percent
 Cabba and similar soils: 20 percent
 Inclusions: 20 percent

Setting

Landform:

- Bitton—Hills
- Ringling—Hills
- Cabba—Hills

Position on landform:

- Bitton—Back slopes and foot slopes
- Ringling—Back slopes and shoulders
- Cabba—Back slopes

Slope:

- Bitton—25 to 70 percent
- Ringling—25 to 70 percent
- Cabba—25 to 70 percent

Elevation: 3,300 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Bitton

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 5.1 inches

Ringling

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Material weathered from baked sandstone and shale
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.2 inches

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

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

Inclusions

- Barvon soils on back slopes
- Doney soils on back slopes
- Wayden soils on back slopes
- Shambo soils on foot slopes
- Areas of rock outcrop

Management

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

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

Blackhall Series

The Blackhall series consists of shallow, well drained soils on sedimentary plains and hills. These soils formed in semiconsolidated, sandy sedimentary beds. Slope is 2 to 70 percent. Elevation is 2,700 to 3,900 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents

Typical Pedon

Blackhall fine sandy loam, warm, in an area of Busby-Twilight-Blackhall, warm, fine sandy loams, 8 to 25 percent slopes; in an area of rangeland, 1,500 feet west and 1,800 feet south of the northeast corner of sec. 15, T. 12 N., R. 41 E.

A—0 to 2 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—2 to 5 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist;

weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

C2—5 to 15 inches; pale yellow (2.5Y 7/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—15 to 60 inches; yellow (2.5Y 7/6) weakly consolidated, sandy sedimentary beds that crush to loamy fine sand, light olive brown (2.5Y 5/4) moist; hard, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 45 degrees F

Depth to bedrock: 10 to 20 inches

A horizon

Hue: 2.5Y or 10YR

Value: 3 to 6 moist; 5 to 7 dry

Chroma: 2 to 6

Clay content: 5 to 15 percent

Reaction: pH 6.6 to 8.4

C horizons

Hue: 5Y to 10YR

Value: 3 to 6 moist; 5 to 7 dry

Chroma: 2 to 6

Clay content: 5 to 15 percent

Reaction: 7.4 to 8.4

Bonfri Series

The Bonfri series consists of moderately deep, well drained soils on sedimentary plains. These soils formed in interbedded shale and sandstone residuum. Slope is 1 to 8 percent. Elevation is 2,600 to 3,200 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Borollic Haplargids

Typical Pedon

Bonfri fine sandy loam, in an area of Bonfri-Marmarth-Bullock fine sandy loams, 1 to 4 percent slopes; in an area of rangeland, 1,000 feet north and 48 feet west of the southeast corner of sec. 15, T. 7 N., R. 38 E.

A1—0 to 3 inches; pale brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak very thin platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; neutral; abrupt smooth boundary.

A2—3 to 6 inches; pale brown (10YR 6/3) fine sandy

loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to weak medium platy; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; neutral; abrupt smooth boundary.

Bt—6 to 13 inches; yellowish brown (10YR 5/4) clay loam, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong fine angular blocky; very hard, firm, sticky and very plastic; common very fine roots; many very fine tubular pores; continuous moderately thick clay films on faces of peds; mildly alkaline; clear smooth boundary.

Bk—13 to 31 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, firm, sticky and plastic; common very fine roots; many very fine tubular pores; common medium soft masses of lime; violently effervescent; moderately alkaline; gradual wavy boundary.

Cr—31 to 60 inches; light gray (5Y 7/2) interbedded layers of shale and sandstone, olive gray (5Y 5/2) moist; hard, very friable, nonsticky and nonplastic; few very fine roots; few brownish yellow (10YR 6/6) iron stains; strongly effervescent; mildly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to bedrock: 20 to 40 inches

Depth to Bk horizon: 13 to 30 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or fine sandy loam

Clay content: 12 to 27 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 27 to 35 percent

Sand content: More than 15 percent fine sand or coarser

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Clay loam, loam, or sandy clay loam

Clay content: 20 to 32 percent

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

33—Bonfri-Bullock, eroded-Cabbart complex, 4 to 25 percent slopes

Composition

Bonfri and similar soils: 30 percent

Bullock and similar soils: 25 percent

Cabbart and similar soils: 25 percent

Inclusions: 20 percent

Setting

Landform:

- Bonfri—Hills
- Bullock—Hills
- Cabbart—Hills

Position on landform:

- Bonfri—Back slopes
- Bullock—Back slopes
- Cabbart—Shoulders and summits

Slope:

- Bonfri—4 to 8 percent
- Bullock—4 to 8 percent
- Cabbart—8 to 25 percent

Elevation: 2,800 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Bonfri

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 5.5 inches

Bullock

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 3.3 inches

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

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

Inclusions

- Abor soils on summits
- Neldore soils on summits
- Forelle and similar soils
- Gerdrum and similar soils
- Yamac and similar soils
- Areas of rock outcrop

Management

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

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

34—Bonfri-Galbreth fine sandy loams, 1 to 8 percent slopes

Composition

Bonfri and similar soils: 55 percent
 Galbreth and similar soils: 25 percent
 Inclusions: 20 percent

Setting

Landform:

- Bonfri—Sedimentary plains
- Galbreth—Sedimentary plains

Position on landform:

- Bonfri—Back slopes
- Galbreth—Shoulders and summits

Slope:

- Bonfri—1 to 4 percent

• Galbreth—1 to 8 percent
Elevation: 2,800 to 3,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Bonfri

Surface layer texture: Fine sandy 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 5.8 inches

Galbreth

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 2.1 inches

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

Inclusions

- Ivanell soils on back slopes
- Delpoint soils on back slopes
- Bullock, eroded, soils
- Forelle soils on foot slopes

Management

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

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

35—Bonfri-Marmarth-Bullock fine sandy loams, 1 to 4 percent slopes

Composition

Bonfri and similar soils: 40 percent
 Marmarth and similar soils: 25 percent
 Bullock and similar soils: 20 percent
 Inclusions: 15 percent

Setting

Landform:

- Bonfri—Sedimentary plains
- Marmarth—Sedimentary plains
- Bullock—Sedimentary plains

Position on landform:

- Bonfri—Back slopes
- Marmarth—Shoulders and summits
- Bullock—Back slopes

Slope:

- Bonfri—1 to 4 percent
- Marmarth—1 to 4 percent
- Bullock—1 to 4 percent

Elevation: 2,600 to 2,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Bonfri

Surface layer texture: Fine sandy 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 5.0 inches

Marmarth

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.6 inches

Bullock

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 3.0 inches

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

Inclusions

- Blackhall soils on shoulders
- Galbreth soils on shoulders
- Areas of slick spots

Management

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

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

Borollic Camborthids

Borollic Camborthids consist of very deep, well drained and somewhat excessively drained soils that formed in alluvium. These soils are on alluvial fans and stream terraces. Slope is 0 to 8 percent. Elevation is 2,500 to 3,400 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the average frost-free period is 115 to 130 days.

Typical Pedon

Borollic Camborthids in an area of Borollic Camborthids-Ustic Torrifluvents complex, 0 to 8 percent slopes; in an area of rangeland, 1,160 feet west and 600 feet north of the southeast corner of sec. 33, T. 12 N., R. 35 E.

A—0 to 7 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; strong fine subangular blocky structure; hard, firm, sticky and plastic; many very fine roots; slightly effervescent; mildly alkaline; gradual smooth boundary.

Bw1—7 to 18 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; many very fine roots between peds; slightly effervescent; moderately alkaline; clear smooth boundary.

Bw2—18 to 32 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse subangular blocky structure; extremely hard, very firm, sticky and very plastic; common very fine roots; slightly effervescent; moderately alkaline; gradual smooth boundary.

BC—32 to 60 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, sticky and very plastic; few

very fine roots; slightly effervescent; moderately alkaline.

Range in Characteristics

Texture: Fine sandy loam to clay

Clay content: 15 to 45 percent

Content of rock fragments: 0 to 40 percent pebbles

Electrical conductivity: 0 to 8 mmhos/cm

36—Borollic Camborthids-Ustic Torrifluents complex, 0 to 8 percent slopes

Composition

Borollic Camborthids and similar soils: 60 percent

Ustic Torrifluents and similar soils: 30 percent

Inclusions: 10 percent

Setting

Landform:

- Borollic Camborthids—Alluvial fans and stream terraces

- Ustic Torrifluents—Flood plains

Slope:

- Borollic Camborthids—0 to 8 percent

- Ustic Torrifluents—0 to 2 percent

Elevation: 2,500 to 3,400 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Borollic Camborthids

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Flooding: None

Ustic Torrifluents

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Flooding: Frequent

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Alona and similar soils
- Gerdrum and similar soils
- Neldore and similar soils
- Areas of soils that have slopes of more than 8 percent
- Somewhat poorly drained soils

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

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

Brunelda Series

The Brunelda series consists of very deep, well drained soils on sedimentary plains. These soils formed in alluvium. Slope is 1 to 8 percent. Elevation is 2,700 to 3,300 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic, frigid Cambic Gypsiorthids

Typical Pedon

Brunelda silty clay, in an area of Brunelda-Vaeda-Nobe complex, 1 to 8 percent slopes; in an area of rangeland, 2,640 feet east and 1,500 feet north of the southwest corner of sec. 23, T. 11 N., R. 35 E.

A—0 to 1 inch; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate very fine granular structure; slightly hard, friable, sticky and plastic; many very fine roots; slightly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—1 to 6 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium angular blocky structure parting to moderate fine and very fine angular blocky; hard, firm, sticky and plastic; many very fine roots and pores; few fine soft masses of lime in the lower part; slightly effervescent; moderately alkaline; clear smooth boundary.

Byz1—6 to 13 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; very hard, firm, very sticky and very plastic; common very fine roots and pores; many fine soft masses of gypsum and other salts; slightly effervescent; mildly alkaline; clear smooth boundary.

Byz2—13 to 40 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; common fine soft masses of salt; strongly alkaline; gradual smooth boundary.

BC—40 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very

hard, very firm, very sticky and very plastic; few very fine pores; mildly alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Depth to Byz1 horizon: 1 to 10 inches

Depth to Byz2 horizon: 10 to 20 inches

A horizon

Clay content: 40 to 50 percent

Reaction: pH 7.4 to 8.4

Bw horizon

Texture: Silty clay or clay

Clay content: 40 to 50 percent

Electrical conductivity: Less than 4 mmhos/cm

Reaction: pH 7.9 to 8.4

Byz1 horizon

Texture: Silty clay or clay

Clay content: 45 to 60 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 20

Reaction: pH 7.4 to 9.0

Byz2 horizon

Texture: Silty clay or clay

Clay content: 45 to 60 percent

Electrical conductivity: 16 to 24 mmhos/cm

Sodium adsorption ratio: 25 to 45

Reaction: pH 7.4 to 9.0

BC horizon

Texture: Silty clay or clay

Clay content: 45 to 60 percent

Electrical conductivity: 16 to 30 mmhos/cm

Sodium adsorption ratio: 25 to 45

Reaction: pH 7.4 to 9.0

37—Brunelda silty clay, 2 to 8 percent slopes

Composition

Brunelda and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,800 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 2.8 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Salt-affected soils on shoulders
- Gerdrum soils on toe slopes
- Vaeda and similar soils

Management

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

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

38—Brunelda-Gerdrum complex, 1 to 8 percent slopes

Composition

Brunelda and similar soils: 40 percent

Gerdrum and similar soils: 40 percent

Inclusions: 20 percent

Setting

Landform:

- Brunelda—Sedimentary plains
- Gerdrum—Sedimentary plains

Position on landform:

- Brunelda—Back slopes
- Gerdrum—Foot slopes

Slope:

- Brunelda—1 to 8 percent
- Gerdrum—1 to 4 percent

Elevation: 2,900 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 120 days

Component Description

Brunelda

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 2.8 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 a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 6.2 inches

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

Inclusions

- Soils that contain less salt
- Bullock soils on shoulders
- Vaeda soils on microlows
- Absher and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

39—Brunelda-Vaeda-Nobe complex, 1 to 8 percent slopes

Composition

Brunelda and similar soils: 35 percent
 Vaeda and similar soils: 30 percent
 Nobe and similar soils: 25 percent
 Inclusions: 10 percent

Setting

Landform:

- Brunelda—Sedimentary plains
- Vaeda—Sedimentary plains
- Nobe—Sedimentary plains

Position on landform:

- Vaeda—Microlows
- Nobe—Microhighs

Slope:

- Brunelda—1 to 8 percent
- Vaeda—1 to 4 percent
- Nobe—1 to 8 percent

Elevation: 2,700 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Brunelda

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 3.0 inches

Vaeda

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 7.9 inches

Nobe

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 4.5 inches

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

Inclusions

- Gerdrum and similar soils
- Bullock soils on shoulders

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Bryant Series

The Bryant series consists of very deep, well drained soils on sedimentary plains and hills. These soils formed in colluvium derived from semiconsolidated, loamy sedimentary beds. Slope is 2 to 15 percent. Elevation is 3,300 to 4,500 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 43 degrees F, and the frost-free period is 100 to 115 days.

Taxonomic Class: Fine-silty, mixed Typic Haploborolls

Typical Pedon

Bryant silt loam, 2 to 8 percent slopes, in an area of rangeland, 2,600 feet south and 2,200 feet east of the northwest corner of sec. 25, T. 5 S., R. 39 E.

A1—0 to 4 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; neutral; clear smooth boundary.

A2—4 to 7 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; neutral; clear wavy boundary.

Bw—7 to 12 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; mildly alkaline; clear wavy boundary.

Bk1—12 to 18 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; few faint masses and films of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—18 to 28 inches; white (10YR 8/2) and pale brown (10YR 6/3) silt loam, pale brown (10YR 6/3) and yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; common threads and fine soft masses of lime; violently effervescent;

moderately alkaline; gradual wavy boundary.
C—28 to 60 inches; very pale brown (10YR 8/3) silt loam that has few lenses of very fine sandy loam, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots and pores; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 12 to 30 inches

A horizon

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.1 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silt loam, loam, or silty clay loam

Clay content: 27 to 35 percent

Sand content: More than 15 percent fine sand or coarser

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam, silt loam, or silty clay loam

Clay content: 22 to 32 percent

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.4 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 20 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

40—Bryant silt loam, 2 to 8 percent slopes

Composition

Bryant and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent
Elevation: 3,300 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 100 to 115 days

Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.9 inches

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

Inclusions

- Bitton and similar soils
- Doney and similar soils
- Ringling soils on summits
- Twin Creek and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

41—Bryant silt loam, 8 to 15 percent slopes

Composition

Bryant and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Hills
Slope: 8 to 15 percent
Elevation: 3,300 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 100 to 115 days

Component Description

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

Flooding: None
Available water capacity: Mainly 10.9 inches

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

Inclusions

- Bitton and similar soils
- Doney and similar soils
- Ringling soils on summits
- Twin Creek and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Bullock Series

The Bullock series consists of moderately deep, well drained soils on sedimentary plains. These soils formed in semiconsolidated, loamy sedimentary beds or interbedded sandstone and shale residuum. Slope is 1 to 8 percent. Elevation is 2,600 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Borollic Natrargids

Typical Pedon

Bullock clay loam, in an area of Bullock, eroded-Rominell complex, 2 to 8 percent slopes; in an area of rangeland, 2,200 feet east and 50 feet north of the southwest corner of sec. 27, T. 10 N., R. 42 E.

E—0 to 2 inches; light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; ¼-inch vesicular crust at the surface; soft, very friable, slightly sticky and slightly plastic; common very fine roots; neutral; abrupt smooth boundary.

Bt—2 to 7 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium columnar structure parting to moderate medium angular blocky; very hard, friable, sticky and plastic; common very fine roots; many very fine

pores; tops of columns coated with bleached silt and sand; many thin clay films on faces of peds and in pores; strongly alkaline; clear smooth boundary.

Bk_{yz}1—7 to 14 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; many very fine pores; common fine soft masses and seams of gypsum and salts; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk_{yz}2—14 to 20 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and coarse subangular blocky structure; hard, friable, sticky and plastic; common very fine roots and pores; few fine soft masses and seams of gypsum and salts; strongly effervescent; moderately alkaline; clear smooth boundary.

C—20 to 28 inches; pale brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky and plastic; few very fine roots; common very fine pores; few fine soft masses of lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

Cr—28 to 60 inches; white (5Y 8/1), semiconsolidated, loamy sedimentary beds that crush to sandy clay loam, light olive gray (5Y 6/2) moist; very hard, firm, sticky and plastic; few very fine roots in cracks in the upper part; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Cr horizon: 20 to 40 inches

E horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 or 4 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam, sandy clay loam, or clay loam

Clay content: 27 to 35 percent

Sodium adsorption ratio: 13 to 20

Reaction: pH 6.6 to 9.0

Bk_{yz} horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 1 to 4

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

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Reaction: pH 7.4 to 9.0

C horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 20 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Reaction: pH 7.4 to 9.0

42—Bullock, eroded-Rallod, warm, clay loams, 2 to 15 percent slopes

Composition

Bullock and similar soils: 55 percent

Rallod and similar soils: 25 percent

Inclusions: 20 percent

Setting

Landform:

- Bullock—Hills

- Rallod—Hills

Position on landform:

- Bullock—Back slopes

- Rallod—Shoulders and summits

Slope:

- Bullock—2 to 8 percent

- Rallod—4 to 15 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Bullock

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 a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 3.3 inches

Ralod

Surface layer texture: Clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 2.6 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Areas of slick spots
- Rominell soils on fans
- Very deep soils that have a surface layer of sandy loam
- Deep soils that have a surface layer of sandy loam
- Areas of rock outcrop on summits

Management

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

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

43—Bullock, eroded-Rominell complex, 2 to 8 percent slopes**Composition**

Bullock and similar soils: 40 percent

Rominell and similar soils: 35 percent

Inclusions: 25 percent

Setting

Landform:

- Bullock—Sedimentary plains
- Rominell—Sedimentary plains

Position on landform:

- Bullock—Back slopes and shoulders
- Rominell—Foot slopes

Slope:

- Bullock—2 to 8 percent
- Rominell—2 to 8 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description**Bullock**

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 a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 3.5 inches

Rominell

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

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 7.5 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Chinook soils that have an alkali substratum
- Ralod and similar soils
- Bullock sandy loam
- Rominell clay loam
- Areas of slick spots

Management

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

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

Busby Series

The Busby series consists of very deep, well drained soils on stream terraces, sedimentary plains, and alluvial fans. These soils formed in alluvium or colluvium. Slope is 0 to 15 percent. Elevation is 2,400 to 3,900 feet. The average annual precipitation is 10 to

14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Coarse-loamy, mixed Borollic Camborthids

Typical Pedon

Busby fine sandy loam, 2 to 8 percent slopes, in an area of rangeland, 1,900 feet west and 2,200 feet north of the southeast corner of sec. 24, T. 1 S., R. 41 E.

A—0 to 4 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium platy structure; slightly hard, very friable, nonsticky and slightly plastic; many very fine and fine roots; many very fine pores; mildly alkaline; clear smooth boundary.

Bw—4 to 13 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak or moderate medium and coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable, nonsticky and slightly plastic; common very fine roots and pores; mildly alkaline; gradual smooth boundary.

Bk1—13 to 26 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; weak coarse prismatic structure; soft, very friable, nonsticky and slightly plastic; common very fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—26 to 47 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; few very fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C—47 to 60 inches; pale brown (10YR 6/3) loamy fine sand, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 8 and 24 inches, dry in all parts between 40 and 50 percent of the cumulative days when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 10 to 20 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 to 4

Texture: Fine sandy loam or loam

Clay content: 10 to 25 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 to 4

Texture: Fine sandy loam, sandy loam, or loam

Clay content: 10 to 18 percent

Reaction: pH 7.4 to 8.4

Effervescence: None to strong

Bk horizon

Hue: 10YR to 5Y

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 2 to 4

Textures: Fine sandy loam or sandy loam

Clay content: 10 to 18 percent

Effervescence: Strong or violent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Texture: Fine sandy loam or sandy loam; loamy fine sand, loamy sand, or fine sand below a depth of 40 inches

Clay content: 3 to 18 percent

Effervescence: Slight to violent

Reaction: pH 7.9 to 8.4

Other features: A Bk horizon in some pedons

44—Busby fine sandy loam, 2 to 8 percent slopes

Composition

Busby and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans

Slope: 2 to 8 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 7.6 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Twilight and similar soils
- Areas of rock outcrop
- Areas of blowouts

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

45—Busby fine sandy loam, 8 to 15 percent slopes

Composition

Busby and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Alluvial fans

Slope: 8 to 15 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 7.1 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Blackhall and similar soils
- Twilight and similar soils
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

46—Busby loam, 0 to 2 percent slopes

Composition

Busby and similar soils: 90 percent
Inclusions: 10 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 2,400 to 3,400 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 8.4 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Yamac and similar soils
- Delpoint and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

47—Busby-Rock outcrop complex, 8 to 15 percent slopes

Composition

Busby and similar soils: 40 percent
 Rock outcrop: 40 percent
 Inclusions: 20 percent

Setting

Landform:

- Busby—Alluvial fans
- Rock outcrop—Hills

Position on landform:

- Busby—Foot slopes
- Rock outcrop—Shoulders and summits

Slope:

- Busby—8 to 15 percent
- Rock outcrop—8 to 70 percent

Elevation: 3,000 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 7.0 inches

Rock outcrop

Definition: Exposures of sandstone bedrock

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

Inclusions

- Blackhall and similar soils
- Twilight and similar soils
- Yetull soils on back slopes
- Chinook soils on toe slopes

Management

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

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

48—Busby-Twilight-Blackhall, warm, fine sandy loams, 2 to 8 percent slopes

Composition

Busby and similar soils: 35 percent
 Twilight and similar soils: 30 percent
 Blackhall and similar soils: 25 percent
 Inclusions: 10 percent

Setting

Landform:

- Busby—Sedimentary plains
- Twilight—Sedimentary plains
- Blackhall—Sedimentary plains

Position on landform:

- Busby—Back slopes and foot slopes
- Twilight—Back slopes
- Blackhall—Shoulders and summits

Slope:

- Busby—2 to 8 percent
- Twilight—2 to 8 percent
- Blackhall—2 to 8 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 7.5 inches

Twilight

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

Blackhall

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.5 inches

A typical soil description with range in characteristics

is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Chinook and similar soils
- Yamac and similar soils
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

49—Busby-Twilight-Blackhall, warm, fine sandy loams, 8 to 25 percent slopes

Composition

Busby and similar soils: 35 percent
Twilight and similar soils: 30 percent
Blackhall and similar soils: 25 percent
Inclusions: 10 percent

Setting

Landform:

- Busby—Alluvial fans
- Twilight—Hills
- Blackhall—Hills

Position on landform:

- Busby—Foot slopes
- Twilight—Back slopes
- Blackhall—Shoulders and summits

Slope:

- Busby—8 to 15 percent
- Twilight—8 to 25 percent
- Blackhall—8 to 25 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 8.2 inches

Twilight

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.9 inches

Blackhall

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.2 inches

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

Inclusions

- Chinook and similar soils
- Yamac soils on toe slopes
- Yetull soils on back slopes
- Areas of rock outcrop on summits

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

50—Busby-Yetull complex, 2 to 8 percent slopes

Composition

Busby and similar soils: 55 percent

Yetull and similar soils: 25 percent

Inclusions: 20 percent

Setting

Landform:

- Busby—Sedimentary plains

- Yetull—Sedimentary plains

Slope:

- Busby—2 to 8 percent
- Yetull—2 to 8 percent

Elevation: 3,000 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 7.2 inches

Yetull

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.6 inches

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

Inclusions

- Blackhall soils on shoulders
- Twilight and similar soils
- Areas of blowouts
- Areas of rock outcrop

Management

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

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

51—Busby-Yetull complex, 8 to 25 percent slopes

Composition

Busby and similar soils: 50 percent

Yetull and similar soils: 35 percent

Inclusions: 15 percent

Setting

Landform:

- Busby—Alluvial fans
- Yetull—Hills

Position on landform:

- Busby—Back slopes
- Yetull—Back slopes and shoulders

Slope:

- Busby—8 to 15 percent
- Yetull—8 to 25 percent

Elevation: 3,000 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Busby

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 7.8 inches

Yetull

Surface layer texture: Loamy fine sand

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium or eolian material

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.6 inches

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

Inclusions

- Blackhall soils on shoulders
- Twilight and similar soils
- Chinook soils on toe slopes
- Areas of blowouts
- Areas of sandstone rock outcrop

Management

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

- "Range" section
- "Agronomy" section
- "Recreation" section
- "Wildlife Habitat" section

- “Engineering” and “Soil Properties” sections

Cabba Series

The Cabba series consists of shallow, well drained soils on hills. These soils formed in semiconsolidated, loamy sedimentary beds. Slope is 8 to 70 percent. Elevation is 3,000 to 4,500 feet. The average annual precipitation is 15 to 17 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 115 days.

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

Typical Pedon

Cabba loam, in an area of Sagedale-Cabba-Wayden complex, 8 to 25 percent slopes; in an area of rangeland, 2,500 feet east and 2,000 feet south of the northwest corner of sec. 22, T. 5 S., R. 39 E.

A—0 to 3 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate fine granular structure; soft, friable, nonsticky and nonplastic; many very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—3 to 7 inches; pale brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots and pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—7 to 12 inches; very pale brown (10YR 7/3) loam, light yellowish brown (10YR 6/4) moist; weak medium platy structure; slightly hard, friable, nonsticky and slightly plastic; many very fine roots and pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—12 to 60 inches; very pale brown (10YR 8/3), semiconsolidated, loamy sedimentary beds that texture to fine sandy loam, pale brown (10YR 6/3) moist; very hard, friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches or to the paralithic contact, frozen from November through March and dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Clay content: 20 to 35 percent in the control section

Content of rock fragments: 0 to 35 percent in the control section

Depth to Cr horizon: 10 to 20 inches

Note: The soils that have chroma of 1 are lithochromic.

A horizon

Hue: 10YR or 2.5Y

Value: 3 to 6 dry; 3 or 4 moist

Chroma: 1 to 4

Texture: Loam or silt loam

Clay content: 10 to 27 percent

Electrical conductivity: 0 to 4 mmhos/cm

Effervescence: None to violent

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 7.4 to 9.0

Bk horizon

Hue: 10YR to 5Y

Value: 5 to 8 dry; 4 to 7 moist

Chroma: 1 to 6

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

Clay content: 20 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles or channers

Calcium carbonate equivalent: 2 to 15 percent

Electrical conductivity: 0 to 8 mmhos/cm

Effervescence: Slight to violent

Reaction: pH 7.4 to 9.0

Cr horizon

Note: This horizon consists of interbedded layers of silt, sand, and clay or of a mixture of the three textures. The layers crush to loam, silt loam, very fine sandy loam, clay loam, or silty clay loam.

Reaction: pH 7.4 to 8.4

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

Composition

Cabba and similar soils: 30 percent

Wayden and similar soils: 30 percent

Rock outcrop: 25 percent

Inclusions: 15 percent

Setting

Landform:

- Cabba—Hills
- Wayden—Hills
- Rock outcrop—Hills

Position on landform:

- Cabba—Back slopes and shoulders
- Wayden—Back slopes and shoulders
- Rock outcrop—Shoulders and summits

Slope:

- Cabba—25 to 70 percent

- Wayden—25 to 70 percent
 - Rock outcrop—25 to 70 percent
- Elevation:* 3,600 to 4,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 105 to 120 days

Component Description

Cabba

Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches

Wayden

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Flooding: None
Available water capacity: Mainly 1.8 inches

Rock outcrop

Definition: Exposures of siltstone and shale bedrock

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

Inclusions

- Doney soils on back slopes
- Bitton soils on back slopes

Management

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

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

53—Cabba-Wayden-Sagedale complex, 25 to 70 percent slopes

Composition

Cabba and similar soils: 30 percent
 Wayden and similar soils: 30 percent

Sagedale and similar soils: 20 percent
 Inclusions: 20 percent

Setting

Landform:

- Cabba—Hills
- Wayden—Hills
- Sagedale—Hills

Position on landform:

- Cabba—Back slopes and shoulders
- Wayden—Back slopes and shoulders
- Sagedale—Back slopes and foot slopes

Slope:

- Cabba—25 to 70 percent
- Wayden—25 to 70 percent
- Sagedale—25 to 35 percent

Elevation: 3,600 to 4,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.0 inches

Wayden

Surface layer texture: Silty clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Flooding: None
Available water capacity: Mainly 1.8 inches

Sagedale

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.3 inches

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

Inclusions

- Doney soils on back slopes

- Shambo soils on foot slopes
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Cabbart Series

The Cabbart series consists of shallow, well drained soils on hills. These soils formed in semiconsolidated, loamy sedimentary beds. Slope is 4 to 70 percent. Elevation is 2,500 to 4,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents

Typical Pedon

Cabbart silt loam, in an area of Cambeth-Cabbart silt loams, 4 to 15 percent slopes; in an area of rangeland, 2,100 feet north and 1,400 feet east of the southwest corner of sec. 17, T. 11 N., R. 43 E.

A—0 to 2 inches; pale brown (10YR 6/3) loam, light olive brown (2.5Y 5/4) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Bk—2 to 12 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—12 to 60 inches; light gray (5Y 7/2), semiconsolidated, loamy sedimentary beds that crush to silt loam, pale olive (5Y 6/3) moist; very hard, friable, slightly sticky and slightly plastic; common very fine roots matted at the top of the horizon; few very fine roots in cracks; slightly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches or to the paralithic contact, dry in all parts

between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Cr horizon: 10 to 20 inches

A horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Loam or silt loam

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 60 percent hard fragments—0 to 20 percent cobbles, 0 to 50 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 1 to 10 percent

Reaction: pH 7.4 to 9.0

Bk horizon

Hue: 10YR to 5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 45 percent—0 to 15 percent hard pebbles, 0 to 45 percent soft pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 1 to 5

Calcium carbonate equivalent: 15 to 25 percent

Reaction: pH 7.4 to 9.0

54—Cabbart-Armells-Rock outcrop complex, 25 to 70 percent slopes

Composition

Cabbart and similar soils: 40 percent

Armells and similar soils: 20 percent

Rock outcrop: 20 percent

Inclusions: 20 percent

Setting

Landform:

- Cabbart—Hills
- Armells—Hills
- Rock outcrop—Hills

Position on landform:

- Cabbart—Back slopes and shoulders
- Armells—Back slopes and foot slopes
- Rock outcrop—Shoulders and summits

Slope:

- Cabbart—25 to 70 percent
- Armells—25 to 70 percent
- Rock outcrop—25 to 70 percent

Elevation: 3,000 to 4,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Cabbart

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.9 inches

Armells

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Rock outcrop

Definition: Exposures of baked and unbaked siltstone bedrock
Flooding: None

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

Inclusions

- Delpoint soils on back slopes
- Yawdim soils on back slopes
- Lonna soils on foot slopes
- Yamac soils on foot slopes

Management

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

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

55—Cabbart-Yawdim-Rock outcrop complex, 15 to 70 percent slopes

Composition

Cabbart and similar soils: 30 percent

Yawdim and similar soils: 30 percent
 Rock outcrop: 30 percent
 Inclusions: 10 percent

Setting

Landform:

- Cabbart—Hills
- Yawdim—Hills
- Rock outcrop—Hills

Position on landform:

- Cabbart—Back slopes and shoulders
- Yawdim—Back slopes
- Rock outcrop—Shoulders and summits

Slope:

- Cabbart—15 to 70 percent
- Yawdim—15 to 70 percent
- Rock outcrop—15 to 70 percent

Elevation: 2,700 to 3,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Cabbart

Surface layer texture: Silt loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.8 inches

Yawdim

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

Rock outcrop

Definition: Exposures of siltstone and shale bedrock
Flooding: None

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

Inclusions

- Delpoint soils on back slopes
- Cambeth soils on back slopes
- Lonna soils on foot slopes

- Kobar soils on foot slopes
- Yamac soils on foot slopes
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Cambeth Series

The Cambeth series consists of moderately deep, well drained soils on sedimentary plains and hills. These soils formed in semiconsolidated, loamy sedimentary beds. Slope is 2 to 15 percent. Elevation is 2,600 to 3,600 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed Borollic Camborthids

Typical Pedon

Cambeth silt loam, in an area of Lonna-Cambeth silt loams, 2 to 8 percent slopes; in an area of cropland, 100 feet south and 1,200 feet west of the northeast corner of sec. 9, T. 11 N., R. 43 E.

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

Bw—5 to 11 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and slightly plastic; many very fine roots; common very fine pores; strongly effervescent; mildly alkaline; gradual smooth boundary.

Bk1—11 to 17 inches; light gray (2.5Y 7/2) silt loam, light brownish gray (2.5Y 6/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and slightly plastic; many very fine roots; common very fine pores; disseminated lime; violently effervescent; strongly alkaline; gradual smooth boundary.

Bk2—17 to 31 inches; pale yellow (2.5Y 7/4) silt loam,

light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, friable, sticky and slightly plastic; common very fine roots and pores; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—31 to 60 inches; light gray (2.5Y 7/2), semiconsolidated, loamy sedimentary beds that texture to silt loam, light brownish gray (2.5Y 6/2) moist; hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Clay content: 18 to 35 percent clay in the control section

Note: Less than 15 percent of the sand is fine or coarser.

Depth to Bk horizon: 10 to 15 inches

Depth to Cr material: 20 to 40 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 18 to 27 percent

Effervescence: None to violent

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Effervescence: None to violent

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, silt loam, or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 10 to 20 percent

Effervescence: Strong or violent

Reaction: pH 7.9 to 9.0

Bk2 horizon

Hue: 10YR to 5Y

Value: 6 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, silt loam, or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 15 to 25 percent

Effervescence: Strong or violent
Reaction: pH 7.9 to 9.0

56—Cambeth silt loam, 2 to 8 percent slopes

Composition

Cambeth and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Elevation: 2,600 to 3,600 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silt loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.3 inches

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

Inclusions

- Cabbart soils on shoulders
- Lonna and similar soils

Management

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

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

57—Cambeth silt loam, 8 to 15 percent slopes

Composition

Cambeth and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Hills
Slope: 8 to 15 percent
Elevation: 2,600 to 3,600 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silt loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.7 inches

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

Inclusions

- Cabbart soils on shoulders
- Lonna and similar soils
- Areas of rock outcrop on summits

Management

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

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

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

Composition

Cambeth and similar soils: 55 percent
Cabbart and similar soils: 30 percent
Inclusions: 15 percent

Setting

Landform:
• Cambeth—Hills
• Cabbart—Hills
Position on landform:
• Cambeth—Back slopes
• Cabbart—Shoulders and summits

Slope:

- Cambeth—4 to 15 percent
- Cabbart—4 to 15 percent

Elevation: 2,600 to 3,600 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 115 to 130 days**Component Description****Cambeth***Surface layer texture:* Silt loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.4 inches**Cabbart***Surface layer texture:* Silt loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 2.2 inches

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

Inclusions

- Lonna soils on foot slopes
- Kobar soils on foot slopes
- Yamac soils on foot slopes
- Yawdim soils on shoulders

Management

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

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

59—Cambeth-Cabbart complex, dissected, 8 to 25 percent slopes**Composition**

Cambeth and similar soils: 45 percent

Cabbart and similar soils: 40 percent

Inclusions: 15 percent

Setting*Landform:*

- Cambeth—Hills
- Cabbart—Hills

Position on landform:

- Cambeth—Back slopes
- Cabbart—Back slopes and shoulders

Slope:

- Cambeth—8 to 15 percent
- Cabbart—8 to 25 percent

Elevation: 2,600 to 3,600 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 115 to 130 days**Component Description****Cambeth***Surface layer texture:* Silt loam*Depth class:* Moderately deep (20 to 40 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 5.6 inches**Cabbart***Surface layer texture:* Loam*Depth class:* Shallow (10 to 20 inches)*Drainage class:* Well drained*Dominant parent material:* Semiconsolidated, loamy sedimentary beds*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 2.6 inches

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

Inclusions

- Lonna soils on foot slopes
- Yamac soils on foot slopes
- Yawdim soils on shoulders
- Areas of rock outcrop

Management

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

- "Range" section
- "Agronomy" section

- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

60—Cambeth-Niler complex, 4 to 15 percent slopes

Composition

Cambeth and similar soils: 60 percent
 Niler and similar soils: 25 percent
 Inclusions: 15 percent

Setting

Landform:

- Cambeth—Hills
- Niler—Hills

Position on landform:

- Cambeth—Back slopes
- Niler—Shoulders and summits

Slope:

- Cambeth—4 to 15 percent
- Niler—4 to 15 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Cambeth

Surface layer texture: Silt loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

Niler

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

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

Inclusions

- Davidell soils on foot slopes

- Ivanell soils on back slopes
- Sumatra soils on summits

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Canburn Series

The Canburn series consists of very deep, very poorly drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 3,200 to 3,800 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 43 degrees F, and the frost-free period is 105 to 120 days.

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Cumulic Haplaquolls

Typical Pedon

Canburn loam, warm, in an area of Straw-Canburn, warm, loams, 0 to 2 percent slopes; in an area of rangeland, 1,100 feet south and 30 feet east of the northwest corner of sec. 12, T. 5 S., R. 38 E.

A1—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; few small distinct yellowish red (5YR 5/6 moist) mottles; weak thin platy structure parting to weak fine granular; slightly hard, friable, nonsticky and nonplastic; many very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

A2—6 to 13 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; common medium faint very dark gray (10YR 3/1 moist) mottles; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, nonsticky and nonplastic; many very fine roots and pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Ag—13 to 27 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; common medium distinct very dark gray (10YR 3/1) and few fine distinct dark yellowish brown (10YR 4/6 moist) mottles; moderate very fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and pores;

strongly effervescent; moderately alkaline; diffuse smooth boundary.

Cg1—27 to 41 inches; grayish brown (10YR 5/2) silt loam that has strata of loam, very dark grayish brown (10YR 3/2) moist; common medium distinct dark gray (10YR 3/1 moist) and many fine distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; hard, friable, nonsticky and nonplastic; common very fine roots; common fine and very fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cg2—41 to 60 inches; light brownish gray (10YR 6/2) loam that has strata of very fine sandy loam, dark grayish brown (2.5Y 4/2) moist; common fine faint brown and very dark gray (10YR 4/3 and 3/1 moist) mottles; massive; hard, friable, nonsticky and nonplastic; few very fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Mollic epipedon thickness: 25 to 45 inches

Depth to seasonal high water table: 0 to 18 inches

A horizons

Hue: 10YR or 2.5Y or neutral

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 0 to 3

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Reaction: pH 7.4 to 9.0

Cg horizon

Hue: 2.5Y to 7.5YR

Value: 4 to 6 dry; 2 to 5 moist

Chroma: 1 to 6

Texture: Silt loam or loam

Clay content: 18 to 27 percent

Reaction: pH 7.9 to 9.0

Castner Series

The Castner series consists of shallow, well drained soils on sedimentary plains. These soils formed in residuum derived from hard sandstone. Slope is 2 to 8 percent. Elevation is 3,600 to 4,400 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 115 days.

Taxonomic Class: Loamy-skeletal, mixed Lithic Haploborolls

Typical Pedon

Castner channery loam, in an area of Castner-Shambo

complex, 2 to 15 percent slopes; in an area of rangeland, 1,200 feet south and 1,850 feet east of the northwest corner of sec. 27, T. 5 S., R. 39 E.

A1—0 to 6 inches; grayish brown (10YR 5/2) channery loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 15 percent channers; slightly effervescent; mildly alkaline; clear wavy boundary.

A2—6 to 9 inches; grayish brown (10YR 5/2) channery loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 25 percent channers; thick lime casts on the undersides of coarse fragments; strongly effervescent; moderately alkaline; abrupt wavy boundary.

Bk—9 to 16 inches; pale brown (10YR 6/3) very channery loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; 50 percent channers; 5 percent flagstones; thick lime coatings on undersides of coarse fragments; strongly effervescent; moderately alkaline; abrupt wavy boundary.

R—16 to 60 inches; hard sandstone; roots matted at the top of the horizon.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: 4 to 12 inches

Mollic epipedon thickness: 7 to 15 inches

Depth to bedrock: 10 to 20 inches

Depth to Bk horizon: 7 to 15 inches

A1 horizon

Hue: 2.5Y to 5YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 to 3

Clay content: 10 to 18 percent

Content of rock fragments: 5 to 45 percent—0 to 15 percent cobbles and stones, 5 to 30 percent pebbles and channers

Reaction: pH 6.6 to 7.8

A2 horizon

Hue: 2.5Y to 5YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 1 to 3

Texture: Loam or sandy loam

Note: Less than 35 percent of the sand is fine or coarser.

Clay content: 10 to 18 percent

Content of rock fragments: 35 to 70 percent—5 to 20 percent cobbles and stones, 30 to 55 percent pebbles and channers

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 2.5Y to 5YR

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

Texture: Loam or sandy loam

Note: Less than 35 percent of the sand is fine or coarser.

Clay content: 10 to 18 percent

Content of rock fragments: 35 to 80 percent—10 to 25 percent cobbles and stones, 25 to 60 percent pebbles and channers

Calcium carbonate equivalent: 3 to 15 percent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

61—Castner-Shambo complex, 2 to 15 percent slopes**Composition**

Castner and similar soils: 40 percent

Shambo and similar soils: 40 percent

Inclusions: 20 percent

Setting**Landform:**

- Castner—Sedimentary plains
- Shambo—Hills

Position on landform:

- Castner—Back slopes and shoulders
- Shambo—Foot slopes

Slope:

- Castner—2 to 8 percent
- Shambo—2 to 15 percent

Elevation: 3,600 to 4,400 feet**Mean annual precipitation:** 15 to 19 inches**Frost-free period:** 100 to 115 days**Component Description****Castner****Surface layer texture:** Channery 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**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

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Bryant soils on foot slopes
- Savage soils on foot slopes

Management

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

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

Chinook Series

The Chinook series consists of very deep, well drained soils on sedimentary plains and alluvial fans. These soils formed in alluvium or in eolian material. Slope is 2 to 8 percent. Elevation is 2,600 to 3,900 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is about 115 to 130 days.

Taxonomic Class: Coarse-loamy, mixed Aridic Haploborolls

Typical Pedon

Chinook fine sandy loam, 2 to 8 percent slopes, in an area of rangeland, 2,580 feet west and 2,450 feet north of the southeast corner of sec. 9, T. 1 S., R. 43 E.

A1—0 to 3 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; neutral; clear smooth boundary.

A2—3 to 14 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; soft, very friable, nonsticky and nonplastic; many very fine roots; common very fine pores; neutral; clear wavy boundary.

Bw—14 to 24 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; weak very coarse prismatic structure parting to weak coarse subangular blocky; soft, very friable, nonsticky and nonplastic; many very fine roots and pores; neutral; clear smooth boundary.

Bk1—24 to 35 inches; pale brown (10YR 6/3) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—35 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 8 and 24 inches

Mollic epipedon thickness: 7 to 15 inches

Depth to Bk horizon: 10 to 35 inches

A1 horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 35 percent pebbles

Reaction: pH 6.6 to 8.4

A2 horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 to 4 moist

Chroma: 2 to 4

Texture: Fine sandy loam or sandy loam

Note: More than 50 percent of the sand is fine or coarser.

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Fine sandy loam or sandy loam

Note: More than 50 percent of the sand is fine or coarser.

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Fine sandy loam or sandy loam

Note: More than 50 percent of the sand is fine or coarser.

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 3 to 10 percent
Reaction: pH 7.4 to 9.0

Bk2 horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Fine sandy loam or sandy loam

Note: More than 50 percent of the sand is fine or coarser.

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

62—Chinook fine sandy loam, 2 to 8 percent slopes

Composition

Chinook and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans

Slope: 2 to 8 percent

Elevation: 2,600 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Kremlin and similar soils
- Lihen and similar soils

Management

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

- "Range" section
- "Agronomy" section
- "Recreation" section

- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

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

Composition

Chinook and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,700 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 7.9 inches

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

Inclusions

- Rominell and similar soils
- Sandy soils on shoulders
- Strongly sodium-affected soils
- Moderately deep soils
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Cooers Series

The Cooers series consists of very deep, well drained soils on sedimentary plains and alluvial fans. These soils formed in alluvium derived from baked

sandstone and shale. Slope is 2 to 8 percent. Elevation is 3,100 to 4,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Borollic Camborthids

Typical Pedon

Cooers loam, in an area of Birney-Cooers-Kirby complex, 2 to 15 percent slopes; in an area of rangeland, 2,100 feet north and 2,500 feet east of the southwest corner of sec. 23, T. 3 S., R. 44 E.

A—0 to 4 inches; brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/4) moist; moderate medium platy structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; neutral; clear smooth boundary.

Bw—4 to 15 inches; reddish brown (5YR 5/4) loam, dark reddish brown (5YR 3/4) moist; weak medium prismatic structure parting to weak coarse subangular blocky; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine tubular pores; 5 percent channers; mildly alkaline; clear smooth boundary.

Bk1—15 to 19 inches; light reddish brown (5YR 6/4) loam, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many very fine pores; 5 percent channers; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—19 to 38 inches; light brown (7.5YR 6/4) loam, reddish brown (5YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common very fine pores; 10 percent channers; disseminated lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

BC—38 to 60 inches; light brown (7.5YR 6/4) channery loam, reddish brown (5YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; 20 percent channers; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 10 to 21 inches

A horizon

Hue: 2.5YR to 7.5YR
 Value: 3 or 4 moist
 Chroma: 3 or 4
 Clay content: 18 to 25 percent
 Content of rock fragments: 0 to 5 percent channers
 Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 2.5YR to 7.5YR
 Value: 3 or 4 moist
 Chroma: 4 to 6
 Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 15 percent hard channers
 Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 2.5YR to 7.5YR
 Chroma: 3 or 4
 Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 15 percent hard channers
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 2.5YR to 7.5YR
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 3 to 6
 Clay content: 18 to 27 percent
 Content of rock fragments: 0 to 20 percent hard channers
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 9.0

BC horizon

Hue: 2.5YR to 7.5YR
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 3 to 6
 Texture: Loam, sandy loam, or fine sandy loam
 Clay content: 10 to 27 percent
 Content of rock fragments: 0 to 25 percent hard channers
 Reaction: pH 7.9 to 9.0

64—Cooers loam, 2 to 8 percent slopes**Composition**

Cooers and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans
Slope: 2 to 8 percent

Elevation: 3,100 to 4,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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

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

Inclusions

- Birney and similar soils
- Spang and similar soils
- Yamac and similar soils

Management

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

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

65—Cooers-Birney complex, 2 to 8 percent slopes**Composition**

Cooers and similar soils: 50 percent
 Birney and similar soils: 30 percent
 Inclusions: 20 percent

Setting

Landform:
 • Cooers—Alluvial fans
 • Birney—Sedimentary plains
Slope:
 • Cooers—2 to 8 percent
 • Birney—2 to 8 percent
Elevation: 3,100 to 4,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Cooers

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 9.6 inches

Birney

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.3 inches

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

Inclusions

- Kirby soils on summits
- Spang and similar soils
- Yamac and similar soils

Management

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

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

66—Cooers-Yamac loams, 2 to 8 percent slopes

Composition

Cooers and similar soils: 40 percent
 Yamac and similar soils: 40 percent
 Inclusions: 20 percent

Setting

Landform:

- Cooers—Sedimentary plains and alluvial fans
- Yamac—Sedimentary plains and alluvial fans

Slope:

- Cooers—2 to 8 percent
- Yamac—2 to 8 percent

Elevation: 3,100 to 4,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Cooers

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

Yamac

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

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

Inclusions

- Birney soils on back slopes
- Cabbart soils on shoulders
- Kirby soils on summits
- Spang soils on summits

Management

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

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

Creed Series

The Creed series consists of very deep, well drained soils on stream terraces. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,700 to 2,800 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic Borollic Natrargids

Typical Pedon

Creed loam, sandy substratum, 0 to 2 percent slopes, in an area of cropland, 900 feet south and 35 feet west of the northeast corner of sec. 34, T. 7 N., R. 38 E.

Ap—0 to 4 inches; light grayish brown (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; neutral; abrupt smooth boundary.

E—4 to 7 inches; light grayish brown (10YR 6/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure parting to strong medium platy; slightly hard, friable, sticky and slightly plastic; common very fine roots and pores; mildly alkaline; abrupt smooth boundary.

Btn—7 to 16 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong medium columnar structure parting to strong medium angular blocky; extremely hard, firm, sticky and plastic; common very fine roots; many very fine pores; many thin clay films on faces of peds and lining interstitial pores; moderately alkaline; clear smooth boundary.

Bkn—16 to 32 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; few very fine roots; common medium masses of lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

BC—32 to 41 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; massive; hard, friable, sticky and plastic; few very fine roots; strongly effervescent; strongly alkaline; clear smooth boundary.

2C—41 to 60 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to secondary lime: 10 to 20 inches

Depth to gypsum and other salts: 22 to 30 inches

Ap horizon

Hue: 10YR to 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 10 to 15 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.1 to 7.3

E horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 7 moist

Chroma: 2 or 3

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

Clay content: 20 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Btn horizon

Hue: 10YR to 5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

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

Clay content: 35 to 55 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 8 to 13

Reaction: pH 7.9 to 8.4

Bkn horizon

Hue: 10YR to 5Y

Value: 4 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silty clay loam, clay loam, sandy clay loam, loam, or clay

Content of rock fragments: 0 to 15 percent pebbles

Clay content: 25 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 13 to 20

Content of gypsum: 0 to 2 percent

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR to 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam or loam, clay loam, or sandy clay loam that is thinly stratified or is thinly stratified with coarser material

Calcium carbonate equivalent: 5 to 15 percent

Clay content: 25 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 25

Content of gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

2C horizon

Hue: 10YR to 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 2 to 8 percent

Calcium carbonate equivalent: 5 to 10 percent
 Content of rock fragments: 0 to 15 percent pebbles
 Electrical conductivity: 4 to 8 mmhos/cm
 Reaction: pH 7.9 to 9.0

67—Creed loam, sandy substratum, 0 to 2 percent slopes

Composition

Creed and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 2,700 to 2,800 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 6.2 inches

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

Inclusions

- Gerdrum soils that have a sandy substratum
- Ponded soils

Management

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

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

Davidell Series

The Davidell series consists of very deep, well drained soils on stream terraces, sedimentary plains,

and alluvial fans. These soils formed in alluvium. Slope is 0 to 4 percent. Elevation is 2,600 to 3,200 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed Borollic Haplargids

Typical Pedon

Davidell loam, in an area of Ivanell-Davidell complex, 2 to 8 percent slopes; in an area of rangeland, 2,000 feet west and 1,500 feet south of the northeast corner of sec. 19, T. 9 N., R. 40 E.

- E1—0 to 2 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate thin platy structure; soft, friable, nonsticky and nonplastic; many very fine roots; many fine pores; mildly alkaline; abrupt smooth boundary.
- E2—2 to 4 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure parting to weak medium platy; slightly hard, friable, nonsticky and nonplastic; many very fine roots and pores; mildly alkaline; clear smooth boundary.
- Bt—4 to 9 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to strong fine angular blocky; hard, firm, sticky and plastic; many very fine roots; few very fine pores; many thin clay films on faces of peds and in pores; mildly alkaline; abrupt smooth boundary.
- Bk1—9 to 25 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak medium angular blocky structure; hard, firm, sticky and plastic; common very fine roots; few very fine pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bk2—25 to 38 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and plastic; few very fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- Byz—38 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; few fine masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the

soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 6 to 14 inches

E horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or silt loam

Clay content: 15 to 24 percent

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam or silty clay loam

Clay content: 27 to 35 percent

Electrical conductivity: Less than 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay loam or silty clay loam

Clay content: 27 to 32 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 8 to 15

Reaction: pH 7.9 to 9.0

Byz horizon

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 24 to 30 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 15 to 30

Reaction: pH 7.9 to 9.0

68—Davidell loam, 2 to 4 percent slopes

Composition

Davidell and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans

Slope: 2 to 4 percent

Elevation: 2,600 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.7 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Alona and similar soils
- Antwerp and similar soils
- Gerdrum and similar soils
- Vanstel and similar soils
- Cambeth soils on summits
- Davidell silty clay loam

Management

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

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

69—Davidell silty clay loam, 0 to 2 percent slopes

Composition

Davidell and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains

Slope: 0 to 2 percent

Elevation: 2,600 to 2,800 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.4 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Gerdrum and similar soils
- Antwerp and similar soils

Management

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

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

70—Davidell-Antwerp silty clay loams, 0 to 4 percent slopes

Composition

Davidell and similar soils: 55 percent

Antwerp and similar soils: 30 percent

Inclusions: 15 percent

Setting

Landform:

- Davidell—Alluvial fans and stream terraces
- Antwerp—Alluvial fans and stream terraces

Position on landform:

- Davidell—Microhighs
- Antwerp—Microlows

Slope:

- Davidell—0 to 4 percent
- Antwerp—0 to 4 percent

Elevation: 2,600 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Davidell

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.7 inches

Antwerp

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.4 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Alona and similar soils
- Gerdrum and similar soils

Management

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

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

Degrad Series

The Degrad series consists of very deep, well drained soils on stream terraces. These soils formed in alluvium. Slope is 0 to 4 percent. Elevation is 2,600 to 2,700 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

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

Typical Pedon

Degrad sandy loam, 0 to 4 percent slopes, in a pastured area, 900 feet south and 2,400 feet east of the northwest corner of sec. 25, T. 6 N., R. 41 E.

Ap—0 to 5 inches; brown (10YR 5/3) sandy loam, very dark grayish brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and

nonplastic; many very fine roots; neutral; clear smooth boundary.

A—5 to 10 inches; brown (10YR 5/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; dark grayish brown (10YR 4/2) organic coatings on faces of peds; neutral; clear irregular boundary.

Bt—10 to 22 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate coarse blocky; hard, friable, sticky and slightly plastic; common very fine roots; many very fine pores; many thin clay films on individual sand grains and on faces of peds; some clay bridging between sand grains; neutral; clear irregular boundary.

Bk—22 to 36 inches; very pale brown (10YR 7/3) sandy clay loam, light yellowish brown (10YR 6/4) moist; weak medium blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many soft masses of lime; strongly effervescent; moderately alkaline; gradual irregular boundary.

2C—36 to 60 inches; pale brown (10YR 6/3) sand, brown (10YR 5/3) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in some part 60 percent or more of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Mollic epipedon thickness: 7 to 16 inches, including part of the Bt horizon

Depth to calcic horizon: 10 to 23 inches

Depth to 2C horizon: 20 to 40 inches, commonly 28 to 37 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

Content of 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 or sandy clay loam

Clay content: 20 to 35 percent

Sand content: 35 to 55 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Sandy clay loam, loam, or clay loam

Clay content: 15 to 30 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Electrical conductivity: Less than 4 mmhos/cm

Calcium carbonate equivalent: 15 to 40 percent

Reaction: pH 7.4 to 9.0

2C horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 0 to 5 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles, 0 to 30 percent pebbles

Calcium carbonate equivalent: 8 to 15 percent

Reaction: pH 7.9 to 8.4

71—Degrand sandy loam, 0 to 4 percent slopes

Composition

Degrad and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Stream terraces

Slope: 0 to 4 percent

Elevation: 2,600 to 2,700 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as

horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Assiniboine and similar soils
- Evanston and similar soils

Management

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

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

Delpoint Series

The Delpoint series consists of moderately deep, well drained soils on sedimentary plains and hills. These soils formed in semiconsolidated, loamy sedimentary beds. Slope is 2 to 70 percent. Elevation is 2,600 to 4,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Borollic Camborthids

Typical Pedon

Delpoint loam, in an area of Delpoint-Cabbart-Yawdim complex, 25 to 70 percent slopes; in an area of rangeland, 1,500 feet west and 2,500 feet north of the southeast corner of sec. 26, T. 5 S., R. 41 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak thick platy structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

Bw—5 to 14 inches; pale brown (10YR 6/3) loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—14 to 27 inches; light brownish gray (2.5Y 6/2) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots and pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—27 to 32 inches; light gray (2.5Y 7/2) silt loam,

olive (5Y 5/3) moist; massive with some horizontal cleavage; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; common fine and medium soft masses and seams of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—32 to 60 inches; light gray (2.5Y 7/2), semiconsolidated, loamy sedimentary beds, pale yellow (2.5Y 7/4) moist; hard, friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 10 to 20 inches

Depth to bedrock: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 to 4

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 5 percent pebbles

Effervescence: None to strong

Reaction: pH 6.6 to 8.4

Note: When mixed to a depth of 7 inches, the surface layer does not meet the requirements for a mollic epipedon.

Bw horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Effervescence: None to violent

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Note: The horizon does not meet the requirements for a calcic horizon because it does not have a calcium carbonate equivalent that is 5 percent or more higher than that of the underlying material or does not have 5 percent or more (by volume) identifiable secondary carbonates.

Effervescence: Strong or violent
Reaction: pH 7.4 to 8.4

- Yawdim soils on back slopes
- Areas of rock outcrop

72—Delpoint-Cabbart loams, 25 to 70 percent slopes

Composition

Delpoint and similar soils: 50 percent
Cabbart and similar soils: 30 percent
Inclusions: 20 percent

Setting

Landform:

- Delpoint—Hills
- Cabbart—Hills

Position on landform:

- Delpoint—Back slopes
- Cabbart—Shoulders and summits

Slope:

- Delpoint—25 to 70 percent
- Cabbart—25 to 70 percent

Elevation: 2,600 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.4 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.1 inches

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

Inclusions

- Busby soils on foot slopes
- Yamac soils on foot slopes

Management

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

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

73—Delpoint-Cabbart-Yamac loams, 8 to 25 percent slopes

Composition

Delpoint and similar soils: 40 percent
Cabbart and similar soils: 20 percent
Yamac and similar soils: 20 percent
Inclusions: 20 percent

Setting

Landform:

- Delpoint—Hills
- Cabbart—Hills
- Yamac—Alluvial fans

Position on landform:

- Delpoint—Back slopes
- Cabbart—Back slopes and shoulders

Slope:

- Delpoint—15 to 25 percent
- Cabbart—8 to 25 percent
- Yamac—8 to 15 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.7 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.8 inches

Yamac

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

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

Inclusions

- Busby soils on foot slopes
- Kobar soils on foot slopes
- Lonna soils on foot slopes
- Cambeth soils on back slopes
- Yawdim soils on back slopes
- Areas of rock outcrop

Management

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

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

74—Delpoint-Cabbart-Yawdim complex, 25 to 70 percent slopes

Composition

Delpoint and similar soils: 35 percent

Cabbart and similar soils: 25 percent

Yawdim and similar soils: 20 percent

Inclusions: 20 percent

Setting

Landform:

- Delpoint—Hills
- Cabbart—Hills
- Yawdim—Hills

Position on landform:

- Delpoint—Back slopes

- Cabbart—Shoulders and summits

- Yawdim—Back slopes

Slope:

- Delpoint—25 to 70 percent

- Cabbart—25 to 70 percent

- Yawdim—25 to 70 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Yawdim

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.9 inches

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

Inclusions

- Cambeth soils on back slopes
- Kobar soils on foot slopes
- Lonna soils on foot slopes
- Yamac soils on foot slopes
- Areas of rock outcrop

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

75—Delpoint-Galbreth complex, 2 to 8 percent slopes

Composition

Delpoint and similar soils: 50 percent
Galbreth and similar soils: 35 percent
Inclusions: 15 percent

Setting

Landform:

- Delpoint—Sedimentary plains
- Galbreth—Sedimentary plains

Slope:

- Delpoint—2 to 8 percent
- Galbreth—2 to 4 percent

Elevation: 2,700 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 6.1 inches

Galbreth

Surface layer texture: Sandy clay 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

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Vanstel soils in drainageways

- Soils that are very shallow over bedrock
- Yamac and similar soils
- Lonna and similar soils
- Cambeth and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

76—Delpoint, moist-Delpoint-Cabbart loams, 15 to 25 percent slopes

Composition

Delpoint, moist, and similar soils: 35 percent

Delpoint and similar soils: 25 percent

Cabbart and similar soils: 25 percent

Inclusions: 15 percent

Setting

Landform:

- Delpoint, moist—Hills
- Delpoint—Hills
- Cabbart—Hills

Position on landform:

- Cabbart—Shoulders and summits

Slope:

- Delpoint, moist—15 to 25 percent, north aspect
- Delpoint—15 to 25 percent, south aspect
- Cabbart—15 to 25 percent

Elevation: 2,900 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Delpoint, moist

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.4 inches

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.8 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.1 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Blackhall soils on summits
- Kirby soils on summits
- Birney soils on back slopes
- Twilight soils on back slopes
- Yawdim soils on back slopes
- Areas of rock outcrop

Management

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

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

77—Delpoint, moist-Delpoint-Cabbart loams, 25 to 70 percent slopes

Composition

Delpoint, moist, and similar soils: 35 percent

Delpoint and similar soils: 30 percent

Cabbart and similar soils: 20 percent

Inclusions: 15 percent

Setting

Landform:

- Delpoint, moist—Hills
- Delpoint—Hills
- Cabbart—Hills

Position on landform:

- Cabbart—Shoulders and summits

Slope:

- Delpoint, moist—25 to 70 percent, north aspect
- Delpoint—25 to 70 percent, south aspect
- Cabbart—25 to 70 percent

Elevation: 2,900 to 3,700 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Delpoint, moist

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 5.5 inches

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.5 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.4 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Yamac soils on foot slopes
- Busby soils on foot slopes
- Cambeth soils on back slopes
- Yawdim soils on back slopes
- Areas of rock outcrop

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

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

DA—Denied access

Description

Access to land for soil survey mapping was denied by landowner.

Doney Series

The Doney series consists of moderately deep, well drained soils on hills. These soils formed in semiconsolidated, loamy sedimentary beds. Slope is 8 to 70 percent. Elevation is 3,000 to 4,900 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 120 days.

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

Typical Pedon

Doney loam, in an area of Macar-Doney-Rock outcrop complex, 15 to 45 percent slopes; in an area of rangeland, 1,370 feet east and 20 feet north of the southwest corner of sec. 13, T. 5 S., R. 39 E.

A—0 to 2 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak fine granular structure; soft, friable, nonsticky and nonplastic; many very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

Bw—2 to 10 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk1—10 to 14 inches; light gray (2.5Y 7/2) loam, light olive brown (2.5Y 5/4) moist; weak fine and very fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine roots and pores; common soft masses and seams of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—14 to 27 inches; pale yellow (2.5Y 7/4) loam, light yellowish brown (2.5Y 6/4) moist; weak medium and

coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; few threads and seams of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—27 to 60 inches; very pale brown (10YR 8/4), semiconsolidated, loamy sedimentary beds that texture to very fine sandy loam, pale yellow (2.5Y 7/4) moist; very hard, friable, nonsticky and nonplastic; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to bedrock: 20 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 55 percent—0 to 10 percent cobbles, 0 to 45 percent pebbles

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles, 0 to 25 percent pebbles

Calcium carbonate equivalent: Less than 15 percent

Reaction: pH 7.9 to 9.0

Bk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 5 or 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 30 percent—0 to 10 percent cobbles, 0 to 20 percent pebbles and channers

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

78—Doney-Bitton-Cabba complex, 15 to 35 percent slopes

Composition

Doney and similar soils: 30 percent

Bitton and similar soils: 30 percent

Cabba and similar soils: 25 percent
Inclusions: 15 percent

Setting

Landform:

- Doney—Hills
- Bitton—Hills
- Cabba—Hills

Position on landform:

- Doney—Back slopes
- Bitton—Back slopes and foot slopes
- Cabba—Shoulders and summits

Slope:

- Doney—15 to 25 percent
- Bitton—15 to 35 percent
- Cabba—25 to 35 percent

Elevation: 3,300 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.9 inches

Bitton

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.2 inches

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

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

Inclusions

- Shambo soils on foot slopes
- Areas of rock outcrop

Management

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

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

Evanston Series

The Evanston series consists of very deep, well drained soils on alluvial fans and stream terraces. These soils formed in alluvium. Slope is 0 to 4 percent. Elevation is 2,500 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Evanston loam, 0 to 4 percent slopes, in a previously cultivated area of grassland, 900 feet south and 100 feet east of the northwest corner of sec. 24, T. 6 N., R. 41 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, friable, nonsticky and nonplastic; many very fine roots; mildly alkaline; clear smooth boundary.

Bt1—7 to 17 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine pores; continuous moderately thick clay films on faces of peds and in pores; mildly alkaline; clear smooth boundary.

Bt2—17 to 20 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium blocky structure; hard, friable, sticky and plastic; common very fine roots and pores; continuous moderately thick clay films on faces of peds and in pores; mildly alkaline; abrupt smooth boundary.

Btk—20 to 28 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist;

moderate medium blocky structure; hard, friable, sticky and slightly plastic; few very fine roots; common very fine pores; few thin clay films on faces of peds; common soft fine masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—28 to 43 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; common soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC—43 to 60 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 8 to 20 inches

Mollic epipedon thickness: 7 to 15 inches

A horizon

Hue: 2.5Y to 7.5YR

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 15 to 27 percent

Reaction: pH 6.6 to 7.8

Bt horizons

Hue: 2.5Y to 7.5YR

Value: 3 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Clay loam, sandy clay loam, or loam

Clay content: 27 to 35 percent

Reaction: pH 7.4 to 8.4

Btk horizon

Hue: 2.5Y to 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy clay loam

Clay content: 27 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

BC horizon

Hue: 2.5Y to 7.5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy clay loam

Clay content: 15 to 30 percent

Reaction: pH 7.4 to 9.0

79—Evanston loam, 0 to 4 percent slopes

Composition

Evanston and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Assinniboine and similar soils
- Vanstel and similar soils
- Ponded soils

Management

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

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

Fergus Variant

The Fergus variant consists of very deep, well drained soils on alluvial fans and stream terraces. These soils formed in alluvium derived from baked shale. Slope is 2 to 8 percent. Elevation is 3,800 to 4,400 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 115 days.

Taxonomic Class: Fine-silty, mixed Typic Argiborolls

Typical Pedon

Fergus variant silt loam, in an area of Fergus variant-Twin Creek complex, 2 to 8 percent slopes; in an area of rangeland, 2,200 feet west and 800 feet south of the northeast corner of sec. 3, T. 3 S., R. 42 E.

A—0 to 4 inches; brown (7.5YR 4/2) silt loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, friable, nonsticky and nonplastic; many very fine roots; mildly alkaline; clear smooth boundary.

AB—4 to 9 inches; brown (7.5YR 4/2) silt loam, dark brown (7.5YR 3/2) moist; weak medium prismatic structure parting to moderate medium and fine subangular blocky; slightly hard, friable, nonsticky and nonplastic; many fine and very fine roots and pores; mildly alkaline; clear smooth boundary.

Bw—9 to 13 inches; reddish brown (5YR 4/3) silty clay loam, dark reddish brown (5YR 3/3) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and plastic; many fine and very fine roots and pores; moderately alkaline; clear smooth boundary.

Bt1—13 to 21 inches; reddish brown (2.5YR 4/4) silty clay loam, dark red (2.5YR 3/6) moist; moderate medium prismatic structure parting to strong fine subangular blocky; very hard, firm, sticky and plastic; many fine and very fine roots; many very fine pores; common thin clay films on faces of peds and in pores; moderately alkaline; clear wavy boundary.

Bt2—21 to 28 inches; reddish brown (2.5YR 4/4) silty clay loam, dark red (2.5YR 3/6) moist; moderate medium and fine prismatic structure parting to strong medium and fine subangular blocky; very hard, firm, sticky and plastic; many fine and very fine roots; many very fine pores; many thin clay films on faces of peds and in pores; moderately alkaline; clear smooth boundary.

Bk1—28 to 32 inches; reddish brown (2.5YR 4/4) silt loam, dark red (2.5YR 3/6) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; many very fine pores; few thin films of lime on faces of peds; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—32 to 50 inches; red (2.5YR 5/6) silt loam, red (2.5YR 4/8) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; few fine threads and films of lime; strongly effervescent; strongly alkaline; gradual wavy boundary.

BC—50 to 60 inches; light red (2.5YR 6/6) silt loam, red (2.5YR 5/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few very fine roots and pores; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Mollic epipedon thickness: 7 to 15 inches

Depth to Bk horizon: 20 to 36 inches

Note: The clay content in the Bt and BC horizons averages less than 35 percent.

A and AB horizons

Hue: 5YR to 10YR

Value: 3 to 5 dry; 2 or 3 moist

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 5YR to 10YR

Value: 3 to 5 dry; 2 or 3 moist

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bt1 horizon

Hue: 5YR to 10YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Clay loam, silty clay loam, or clay

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bt2 horizon

Hue: 2.5YR to 7.5YR

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 6

Texture: Clay loam, clay, or silty clay loam

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 2.5YR to 7.5YR

Value: 4 to 7 dry; 3 to 5 moist

Chroma: 2 to 8

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

BC horizon

Hue: 2.5YR to 7.5YR

Value: 4 to 7 dry; 3 to 5 moist

Chroma: 2 to 8

Clay content: 20 to 27 percent
 Content of rock fragments: 0 to 15 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 9.0

80—Fergus variant-Twin Creek complex, 2 to 8 percent slopes

Composition

Fergus variant and similar soils: 45 percent
 Twin Creek and similar soils: 35 percent
 Inclusions: 20 percent

Setting

Landform:

- Fergus variant—Alluvial fans and stream terraces
- Twin Creek—Alluvial fans and stream terraces

Slope:

- Fergus variant—2 to 8 percent
- Twin Creek—2 to 8 percent

Elevation: 3,800 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Fergus variant

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 11.2 inches

Twin Creek

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

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

Inclusions

- Bitton soils on shoulders
- Ringling soils on shoulders
- Areas of rock outcrop on summits

Management

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

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

Floweree Series

The Floweree series consists of very deep, well drained soils on stream terraces and alluvial fans. These soils formed in alluvium. Slope is 0 to 8 percent. Elevation is 2,500 to 3,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed Aridic Haploborolls

Typical Pedon

Floweree silt loam, 2 to 8 percent slopes, in a previously cultivated area of grassland, 1,800 feet south and 600 feet east of the northwest corner of sec. 24, T. 6 N., R. 42 E.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure in the upper part and moderate fine and medium platy structure in the lower part; soft, very friable, slightly sticky and slightly plastic; many very fine and few fine roots; mildly alkaline; abrupt smooth boundary.

Bw—7 to 11 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; moderate medium prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; moderately alkaline; abrupt smooth boundary.

Bk1—11 to 19 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—19 to 24 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; common fine threads and soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

BC1—24 to 42 inches; light brownish gray (2.5Y 6/2) silt

loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

BC2—42 to 60 inches; grayish brown (2.5Y 5/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Mollic epipedon thickness: 7 to 16 inches

Clay content: 20 to 35 percent in the control section

Depth to Bk horizon: 11 to 25 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Clay content: 20 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

81—Floweree silt loam, 0 to 2 percent slopes

Composition

Floweree and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 2 percent

Elevation: 2,500 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.6 inches

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

Inclusions

- Chinook and similar soils
- Kremlin and similar soils
- Vanstel and similar soils
- Ponded soils

Management

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

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

82—Floweree silt loam, 2 to 8 percent slopes

Composition

Floweree and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Alluvial fans and stream terraces
Slope: 2 to 8 percent
Elevation: 2,500 to 3,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.5 inches

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

Inclusions

- Chinook and similar soils
- Kremlin and similar soils
- Vanstel and similar soils
- Floweree silty clay loam

Management

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

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

83—Floweree-Vanstel silt loams, 0 to 4 percent slopes**Composition**

Floweree and similar soils: 55 percent
 Vanstel and similar soils: 30 percent
 Inclusions: 15 percent

Setting

Landform:
 • Floweree—Alluvial fans and stream terraces
 • Vanstel—Alluvial fans and stream terraces
Position on landform:
 • Floweree—Back slopes
 • Vanstel—Foot slopes

Slope:

- Floweree—0 to 4 percent
 - Vanstel—0 to 2 percent
- Elevation:* 2,500 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description**Floweree**

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.5 inches

Vanstel

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.4 inches

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

Inclusions

- Evanston and similar soils
- Kremlin and similar soils
- Ponded soils

Management

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

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

Fluventic Haploborolls

Fluventic Haploborolls consist of very deep, moderately well drained and well drained soils that formed in alluvium on stream terraces and alluvial fans. Slope is 0 to 4 percent. Elevation is 3,500 to 4,200 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 115 days.

Typical Pedon

Fluventic Haploborolls in an area of Fluventic Haploborolls-Typic Fluvaquents complex, 0 to 4 percent slopes; in an area of rangeland, 520 feet north of the center of sec. 21, T. 4 S., R. 40 E.

A—0 to 13 inches; grayish brown (2.5Y 5/2) silt loam, very dark grayish brown (2.5Y 3/2) moist; moderate coarse and medium granular structure parting to moderate fine subangular blocky; mildly alkaline; hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; slightly effervescent; gradual wavy boundary.

Bw—13 to 20 inches; grayish brown (2.5Y 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and fine subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; common very fine tubular pores; slightly effervescent; mildly alkaline; gradual wavy boundary.

C1—20 to 38 inches; light brownish gray (2.5Y 6/2) silty clay loam, olive brown (2.5Y 4/3) moist; massive; hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; few fine soft masses of lime; slightly effervescent; mildly alkaline; gradual wavy boundary.

C2—38 to 60 inches; light yellowish brown (2.5Y 6/3), stratified silt loam and silty clay loam, light olive brown (2.5Y 5/3) moist; massive; hard, friable, sticky and plastic; few very fine tubular pores; slightly effervescent; mildly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Mollic epipedon thickness: 7 to 15 inches

Clay content: 20 to 40 percent in the control section

Sand content: 10 to 30 percent in the control section

84—Fluventic Haploborolls-Typic Fluvaquents complex, 0 to 4 percent slopes

Composition

Fluventic Haploborolls and similar soils: 50 percent
Typic Fluvaquents and similar soils: 50 percent

Setting

Landform:

- Fluventic Haploborolls—Alluvial fans and stream terraces

- Typic Fluvaquents—Stream channels

Slope:

- Fluventic Haploborolls—0 to 4 percent
- Typic Fluvaquents—0 to 2 percent

Elevation: 3,500 to 4,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Fluventic Haploborolls

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Flooding: Occasional

Typic Fluvaquents

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Flooding: Frequent

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Management

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

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

Forelle Series

The Forelle series consists of very deep, well drained soils on sedimentary plains and alluvial fans. These soils formed in alluvium. Slope is 2 to 8 percent. Elevation is 2,600 to 3,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Borollic Haplargids

Typical Pedon

Forelle loam, warm, 2 to 8 percent slopes, in an area of rangeland, 900 feet east and 600 feet south of the northwest corner of sec. 30, T. 7 N., R. 43 E.

A—0 to 4 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak very thin platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; neutral; abrupt smooth boundary.

BA—4 to 6 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; mildly alkaline; abrupt smooth boundary.

Bt—6 to 21 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine roots; few fine pores; few or common thin clay films on faces of peds and in pores; mildly alkaline; gradual smooth boundary.

Bw—21 to 32 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; strong coarse subangular blocky structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine pores; moderately alkaline; gradual smooth boundary.

Bk—32 to 39 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine pores; few soft masses of disseminated lime; slightly effervescent; strongly alkaline; gradual smooth boundary.

C—39 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; few fine pores; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 12 to 36 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 6 moist

Chroma: 2 to 4

Clay content: 20 to 27 percent

Reaction: pH 6.6 to 7.8

BA horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 25 to 35 percent

Reaction: pH 7.4 to 7.9

Bt horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 6 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 25 to 35 percent

Reaction: pH 7.4 to 7.9

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 6 moist

Chroma: 2 to 4

Clay content: 25 to 35 percent

Reaction: pH 6.6 to 7.9

Bk horizon

Hue: 10YR or 2.5Y

Value: 6 to 8 dry; 4 to 7 moist

Chroma: 1 to 6

Clay content: 20 to 27 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

C horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 6

Clay content: 20 to 27 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

85—Forelle loam, warm, 2 to 8 percent slopes

Composition

Forelle and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans

Slope: 2 to 8 percent

Elevation: 2,600 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 10.2 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Gerdrum soils on microlows
- Vanstel and similar soils
- Yamac and similar soils

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

86—Forelle, warm-Gerdrum complex, 2 to 8 percent slopes

Composition

Forelle and similar soils: 60 percent
Gerdrum and similar soils: 35 percent
Inclusions: 5 percent

Setting

Landform:

- Forelle—Sedimentary plains and alluvial fans
- Gerdrum—Sedimentary plains and alluvial fans

Position on landform:

- Forelle—Microhighs
- Gerdrum—Microlows

Slope:

- Forelle—2 to 8 percent
- Gerdrum—2 to 8 percent

Elevation: 2,600 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Forelle

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 10.4 inches

Gerdrum

Surface layer texture: Clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as

horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Davidell and similar soils
- Areas of slick spots

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Galbreth Series

The Galbreth series consists of shallow, well drained soils on sedimentary plains and hills. These soils formed in residuum derived from consolidated sandstone. Slope is 1 to 15 percent. Elevation is 2,600 to 3,300 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Loamy, mixed, shallow Borollic Camborthids

Typical Pedon

Galbreth sandy clay loam, 1 to 4 percent slopes, in an area of rangeland, 2,000 feet north and 300 feet east of the southwest corner of sec. 20, T. 8 N., R. 38 E.

Ap1—0 to 2 inches; brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; mildly alkaline; abrupt smooth boundary.

Ap2—2 to 7 inches; brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak medium platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; mildly alkaline; abrupt smooth boundary.

Bw—7 to 13 inches; yellowish brown (10YR 5/4) sandy clay loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate coarse angular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; mildly alkaline; clear smooth boundary.

Cr1—13 to 34 inches; light gray (5Y 7/1), fractured, consolidated sandstone, gray (5Y 6/1) moist;

common very fine roots matted at the top of the horizon and in fractures in the upper part; moderately thick lime coatings along fracture planes in the upper part; clear smooth boundary.

Cr2—34 to 60 inches; light gray (5Y 7/2) and yellow (10YR 7/6), semiconsolidated, sandy sedimentary beds that texture to loamy fine sand, yellowish brown (2.5Y 5/4) and brownish yellow (10YR 6/8) moist; hard, very friable, nonsticky and nonplastic; few yellowish brown (10YR 5/8) iron stains; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Cr horizon: 10 to 20 inches

Ap horizon

Chroma: 2 or 3

Texture: Fine sandy loam or sandy clay loam

Clay content: 10 to 27 percent

Reaction: pH 7.4 to 8.4

Bw horizon

Chroma: 2 to 4

Texture: Loam or sandy clay loam

Clay content: 20 to 30 percent

Reaction: pH 7.4 to 8.4

Cr1 horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 to 4

Cr2 horizon

Hue: 10YR to 5Y

Value: 6 or 7 dry; 5 or 6 moist

87—Galbreth sandy clay loam, 1 to 4 percent slopes

Composition

Galbreth and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains

Slope: 1 to 4 percent

Elevation: 2,600 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Sandy clay 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 1.9 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Delpoint and similar soils
- Soils that are very shallow over bedrock

Management

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

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

Gerdrum Series

The Gerdrum series consists of deep and very deep, well drained soils on alluvial fans and stream terraces. These soils formed in alluvium. Slope is 0 to 8 percent. Elevation is 2,500 to 3,900 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic Borollic Natrargids

Typical Pedon

Gerdrum clay loam, 2 to 8 percent slopes, in an area of rangeland, 600 feet south and 1,600 feet east of the northwest corner of sec. 16, T. 5 N., R. 38 E.

E—0 to 3 inches; light gray (2.5Y 7/2) loam, dark grayish brown (10YR 4/2) moist; weak thick platy structure parting to moderate fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine roots; mildly alkaline; abrupt smooth boundary.

Btn1—3 to 11 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; strong medium columnar structure parting to strong medium angular blocky; extremely hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; continuous moderately thick clay films on faces of

pedes and in pores; mildly alkaline; clear smooth boundary.

Btn2—11 to 14 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; extremely hard, firm, sticky and plastic; common very fine roots and pores; strongly alkaline; clear smooth boundary.

Bkn—14 to 23 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; few very fine roots; few fine soft masses of lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

Byz—23 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, firm, sticky and plastic; few very fine roots; common fine soft masses of gypsum; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bkn horizon: 10 to 24 inches

Depth to gypsum: 10 to 28 inches

Depth to bedrock: 40 to 60 inches

E horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 20 to 50 percent

Content of rock fragments: 0 to 15 percent pebbles

Reaction: pH 6.6 to 7.8

Btn1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 55 percent

Content of rock fragments: 0 to 10 percent pebbles

Structure: Fine to coarse columnar or medium or coarse blocky

Hardness: Extremely hard or very hard when dry

Electrical conductivity: 1 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 20

Note: When the sodium adsorption ratio is less than 13, the horizon has 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 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 55 percent

Content of rock fragments: 0 to 10 percent pebbles

Structure: Fine to coarse prismatic or medium or coarse blocky

Hardness: Extremely hard or very hard when dry

Electrical conductivity: 1 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 20

Reaction: pH 7.4 to 9.0

Bkn horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

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

Clay content: 35 to 55 percent

Content of 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

Byz horizon

Hue: 10YR to 5Y

Value: 4 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 30 to 50 percent

Content of 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

Content of gypsum: 1 to 5 percent

Reaction: pH 7.9 to 9.0

88—Gerdrum clay loam, 0 to 2 percent slopes

Composition

Gerdrum and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 2,500 to 3,900 feet

Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 6.2 inches

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

Inclusions

- Davidell and similar soils
- Kobar and similar soils
- Creed and similar soils
- Vanda and similar soils

Management

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

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

89—Gerdrum clay loam, 2 to 8 percent slopes

Composition

Gerdrum and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans
Slope: 2 to 8 percent
Elevation: 2,500 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 120 days

Component Description

Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 6.3 inches

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

Inclusions

- Davidell and similar soils
- Creed and similar soils
- Vanda and similar soils
- Kobar and similar soils
- Weingart and similar soils

Management

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

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

90—Gerdrum-Kobar silty clay loams, 0 to 2 percent slopes

Composition

Gerdrum and similar soils: 40 percent
 Kobar and similar soils: 40 percent
 Inclusions: 20 percent

Setting

Landform:

- Gerdrum—Stream terraces
- Kobar—Stream terraces

Slope:

- Gerdrum—0 to 2 percent
- Kobar—0 to 2 percent

Elevation: 2,500 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

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

Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 6.1 inches

Kobar

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 9.7 inches

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

Inclusions

- Lonna and similar soils
- Yamac and similar soils
- Areas of slick spots

Management

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

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

91—Gerdrum-Kobar silty clay loams, 2 to 8 percent slopes

Composition

Gerdrum and similar soils: 40 percent
 Kobar and similar soils: 40 percent
 Inclusions: 20 percent

Setting

Landform:

- Gerdrum—Sedimentary plains and alluvial fans
- Kobar—Sedimentary plains and alluvial fans

Slope:

- Gerdrum—2 to 8 percent
- Kobar—2 to 8 percent

Elevation: 2,500 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Gerdrum

Surface layer texture: Silty clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 6.2 inches

Kobar

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 9.7 inches

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

Inclusions

- Lonna and similar soils
- Yamac and similar soils
- Areas of slick spots

Management

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

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

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

Composition

Gerdrum and similar soils: 50 percent
 Marvan and similar soils: 40 percent
 Inclusions: 10 percent

Setting

Landform:

- Gerdrum—Alluvial fans
- Marvan—Alluvial fans

Slope:

- Gerdrum—2 to 8 percent
- Marvan—2 to 8 percent

Elevation: 2,600 to 3,200 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 115 to 130 days**Component Description****Gerdrum***Surface layer texture:* Silty clay*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within a depth of 30 inches*Sodium affected:* Sodic within a depth of 30 inches*Available water capacity:* Mainly 6.3 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*Salt affected:* Saline within a depth of 30 inches*Sodium affected:* Sodic within a depth of 30 inches*Available water capacity:* Mainly 6.7 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Kobar and similar soils
- Vanda and similar soils

Management

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

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

93—Gerdrum-Vanda silty clays, 0 to 4 percent slopes**Composition**

Gerdrum and similar soils: 55 percent

Vanda and similar soils: 30 percent

Inclusions: 15 percent

Setting*Landform:*

- Gerdrum—Alluvial fans and stream terraces
- Vanda—Alluvial fans and stream terraces

Position on landform:

- Gerdrum—Microhighs
- Vanda—Microlows

Slope:

- Gerdrum—0 to 4 percent
- Vanda—0 to 4 percent

Elevation: 2,500 to 3,200 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 115 to 130 days**Component Description****Gerdrum***Surface layer texture:* Silty clay*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within a depth of 30 inches*Sodium affected:* Sodic within a depth of 30 inches*Available water capacity:* Mainly 6.3 inches**Vanda***Surface layer texture:* Silty clay*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within a depth of 30 inches*Sodium affected:* Sodic within a depth of 30 inches*Available water capacity:* Mainly 6.0 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Marvan and similar soils
- Abor soils on shoulders
- Neldore soils on shoulders

Management

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

- "Range" section

- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

94—Gerdrum, shale substratum-Volborg, saline, complex, 1 to 4 percent slopes

Composition

Gerdrum and similar soils: 60 percent

Volborg and similar soils: 25 percent

Inclusions: 15 percent

Setting

Landform:

- Gerdrum—Sedimentary plains
- Volborg—Sedimentary plains

Position on landform:

- Gerdrum—Microhighs
- Volborg—Microlows

Slope:

- Gerdrum—1 to 4 percent
- Volborg—1 to 4 percent

Elevation: 2,800 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Gerdrum

Surface layer texture: Loam

Depth class: Deep (40 to 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 4.7 inches

Volborg

Surface layer texture: Silty clay

Depth class: Shallow (10 to 14 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Available water capacity: Mainly 1.5 inches

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

Inclusions

- Ivanell and similar soils
- Orinoco and similar soils
- Louscot and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Glendive Series

The Glendive series consists of very deep, well drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,400 to 3,400 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Coarse-loamy, mixed (calcareous), frigid Ustic Torrfluvents

Typical Pedon

Glendive loam, 0 to 2 percent slopes, occasionally flooded, in an area of cropland, 2,000 feet east and 1,350 feet south of the northwest corner of sec. 7, T. 6 N., R. 43 E.

- Ap—0 to 4 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; hard, friable, nonsticky and slightly plastic; many fine roots; slightly effervescent; mildly alkaline; abrupt smooth boundary.
- C1—4 to 17 inches; light brownish gray (10YR 6/2) loam, brown (10YR 5/3) moist; massive; slightly hard, friable, nonsticky and slightly plastic; common fine roots and pores; slightly effervescent; mildly alkaline; abrupt smooth boundary.
- C2—17 to 30 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.
- C3—30 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, friable, nonsticky and slightly plastic; few very fine roots; common very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 8 and 24 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Ap horizon

Hue: 10YR to 5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

Texture: Loam or fine sandy loam

Clay content: 10 to 20 percent

Effervescence: None to violent

Reaction: pH 6.6 to 8.4

C1 and C2 horizons

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Effervescence: Slight to violent

Reaction: pH 7.4 to 8.4

C3 horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Sandy loam or fine sandy loam that has thin layers of loam, sandy loam, silt loam, loamy sand, loamy fine sand, and clay loam

Clay content: 5 to 18 percent

Content of rock fragments: 0 to 15 percent pebbles

Effervescence: Strong or violent

Reaction: pH 7.4 to 8.4

95—Glendive loam, 0 to 2 percent slopes, occasionally flooded**Composition**

Glendive and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 3,400 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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: Occasional

Available water capacity: Mainly 8.0 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Hanly and similar soils
- Havre and similar soils
- Glendive sandy loam
- Areas of soils that are rarely flooded

Management

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

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

Hanly Series

The Hanly series consists of very deep, somewhat excessively drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,400 to 3,400 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Sandy, mixed, frigid Ustic Torrifluvents

Typical Pedon

Hanly loam, in an area of Hanly-Glendive loams, 0 to 2 percent slopes, occasionally flooded; in an area of rangeland, 2,400 feet east and 1,700 feet south of the northwest corner of sec. 27, T. 1 S., R. 44 E.

A1—0 to 3 inches; grayish brown (2.5Y 5/2) fine sandy loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

A2—3 to 6 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine and

medium granular structure; slightly hard, very friable, nonsticky and nonplastic; few very fine roots; few very fine discontinuous tubular pores; strongly effervescent; mildly alkaline; clear smooth boundary.

C1—6 to 21 inches; light brownish gray (2.5Y 6/2), stratified loamy sand and fine sand, grayish brown (2.5Y 5/2) moist; moderate fine and medium granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; few very fine discontinuous tubular pores; 5 percent hard angular pebbles; strongly effervescent; mildly alkaline; clear wavy boundary.

C2—21 to 38 inches; light gray (2.5Y 7/2) fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; 10 percent pebble-sized coal fragments and 5 percent flat angular pebbles of hard baked shale; strongly effervescent; mildly alkaline; clear smooth boundary.

C3—38 to 42 inches; pale yellow (2.5Y 7/4) very fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; few pebble-sized coal fragments and few flat angular pebbles of hard baked shale; strongly effervescent; mildly alkaline; clear smooth boundary.

C4—42 to 60 inches; light brownish gray (2.5Y 6/2), stratified very fine sand and fine sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; 2 percent pebble-sized coal fragments; 4 percent pebbles of hard baked shale; strongly effervescent; mildly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 8 and 24 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

A horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 0 to 15 percent pebbles

Effervescence: Slight to violent

Reaction: pH 7.4 to 8.4

C horizons

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loamy sand or fine sand

Clay content: 5 to 10 percent

Content of rock fragments: 0 to 15 percent pebbles

Effervescence: Slight to violent

Reaction: pH 7.4 to 8.4

96—Hanly-Glendive loams, 0 to 2 percent slopes, occasionally flooded

Composition

Hanly and similar soils: 50 percent

Glendive and similar soils: 40 percent

Inclusions: 10 percent

Setting

Landform:

- Hanly—Flood plains
- Glendive—Flood plains

Slope:

- Hanly—0 to 2 percent
- Glendive—0 to 2 percent

Elevation: 2,400 to 3,400 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Hanly

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Somewhat excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Occasional

Available water capacity: Mainly 4.1 inches

Glendive

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 7.6 inches

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

Inclusions

- Havre and similar soils
- Glendive fine sandy loam

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Harlem Series

The Harlem series consists of very deep, well drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,400 to 3,400 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Ustic Torrifuvents

Typical Pedon

Harlem silty clay, 0 to 2 percent slopes, occasionally flooded, in an area of cropland, 2,200 feet west and 200 feet south of the northeast corner of sec. 10, T. 6 N., R. 41 E.

Ap—0 to 10 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine angular blocky structure; hard, firm, sticky and plastic; many very fine roots; slightly effervescent; mildly alkaline; abrupt smooth boundary.

C1—10 to 18 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium angular blocky structure; hard, firm, sticky and plastic; many very fine roots and pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

C2—18 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; common very fine roots; many very fine pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C3—30 to 43 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, friable, slightly sticky and plastic; few very fine roots; many very fine pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C4—43 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; slightly effervescent; mildly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam or silty clay

Clay content: 27 to 50 percent

Effervescence: Slight or strong

Reaction: pH 7.4 to 8.4

C1 horizon

Hue: 10YR to 5Y

Value: 4 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam that has strata of clay, silt loam, silty clay loam, and silty clay

Clay content: 35 to 60 percent

Effervescence: Strong or violent

Reaction: pH 7.4 to 8.4

C2 horizon

Hue: 10YR to 5Y

Value: 4 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam that has strata of clay, silt loam, silty clay loam, and silty clay

Clay content: 35 to 60 percent

Effervescence: Strong or violent

Reaction: pH 7.4 to 8.4

C3 horizon

Hue: 10YR to 5Y

Value: 4 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silt loam, loam, clay loam, or fine sandy loam that has strata of silty clay loam, silt loam, and fine sandy loam

Clay content: 15 to 35 percent

Effervescence: Strong or violent

Reaction: pH 7.9 to 8.4

97—Harlem silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Harlem and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent
Elevation: 2,400 to 2,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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: Occasional
Available water capacity: Mainly 9.6 inches

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

Inclusions

- Havre and similar soils
- Harlem silty clay
- Somewhat poorly drained soils

Management

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

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

98—Harlem silty clay, 0 to 2 percent slopes, occasionally flooded

Composition

Harlem and similar soils: 90 percent
 Inclusions: 10 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,400 to 2,600 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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: Occasional
Available water capacity: Mainly 9.3 inches

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

Inclusions

- Hanly and similar soils
- Areas of soils that are frequently flooded

Management

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

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

Havre Series

The Havre series consists of very deep, well drained and somewhat poorly drained soils on flood plains. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,400 to 3,400 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed (calcareous), frigid Ustic Torrifuvents

Typical Pedon

Havre loam, 0 to 2 percent slopes, occasionally flooded, in an area of cropland, 2,400 feet north and 200 feet west of the southeast corner of sec. 18, T. 6 N., R. 44 E.

Ap—0 to 12 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C1—12 to 22 inches; light brownish gray (10YR 6/2) very fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and slightly plastic; common very fine roots and pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C2—22 to 28 inches; light brownish gray (10YR 6/2) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—28 to 36 inches; light brownish gray (10YR 6/2) light clay loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C4—36 to 60 inches; light brownish gray (10YR 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or silty clay loam

Clay content: 10 to 40 percent

Calcium carbonate equivalent: 1 to 5 percent

Effervescence: None to strong

Electrical conductivity: 0 to 2 mmhos/cm; 4 to 16 mmhos/cm in the saline phase

Sodium adsorption ratio: 0 to 4

Reaction: pH 7.4 to 9.0

C1 horizon

Hue: 10YR to 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam, silt loam, or clay loam that has strata of silt loam, fine sandy loam, silty clay loam, and clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 1 to 10 percent

Effervescence: Slight or strong

Electrical conductivity: 0 to 16 mmhos/cm; 4 to 16 mmhos/cm in the saline phase

Sodium adsorption ratio: 0 to 13

Reaction: pH 7.4 to 9.0

C2, C3, and C4 horizons

Hue: 10YR to 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

loam that has strata of silt loam, fine sandy loam, silty clay loam, and clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 1 to 10 percent

Effervescence: Slight or strong

Electrical conductivity: 0 to 16 mmhos/cm; 4 to 16 mmhos/cm in the saline phase

Sodium adsorption ratio: 0 to 13

Reaction: pH 7.4 to 9.0

99—Havre loam, 0 to 2 percent slopes

Composition

Havre and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Glendive and similar soils
- Harlem and similar soils
- Havre silty clay loam
- Soils that have a gravelly substratum

Management

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

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

100—Havre loam, 0 to 2 percent slopes, occasionally flooded

Composition

Havre and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,400 to 3,400 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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: Occasional
Available water capacity: Mainly 9.8 inches

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

Inclusions

- Glendive and similar soils
- Harlem and similar soils
- Moderately well drained soils

Management

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

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

101—Havre silty clay loam, 0 to 2 percent slopes, occasionally flooded

Composition

Havre and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent
Elevation: 2,400 to 2,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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: Forest land
Flooding: Occasional
Available water capacity: Mainly 9.6 inches

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

Inclusions

- Glendive and similar soils
- Harlem and similar soils
- Areas of soils that are rarely flooded
- Havre loam

Management

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

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

102—Havre silty clay loam, moderately wet, 0 to 2 percent slopes, occasionally flooded

Composition

Havre and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,400 to 2,600 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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: Occasional
Water table: Apparent
Available water capacity: Mainly 10.1 inches

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

Inclusions

- Harlem and similar soils
- Havre silty clay soils
- Moderately saline soils

Management

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

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

103—Havre silty clay loam, saline, 0 to 2 percent slopes, frequently flooded

Composition

Havre and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 2,400 to 2,800 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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: Frequent
Water table: Apparent
Ponding duration: Long
Salt affected: Saline within a depth of 30 inches
Available water capacity: Mainly 6.6 inches

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

Inclusions

- Glendive and similar soils
- Harlem and similar soils
- Very strongly saline soils
- Somewhat poorly drained soils

Management

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

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

104—Havre, Harlem, and Glendive soils, channeled, 0 to 2 percent slopes

Composition

Havre and similar soils: 35 percent
 Harlem and similar soils: 30 percent
 Glendive and similar soils: 25 percent
 Inclusions: 10 percent

Setting

Landform:
 • Havre—Flood plains
 • Harlem—Flood plains
 • Glendive—Flood plains
Slope:
 • Havre—0 to 2 percent
 • Harlem—0 to 2 percent
 • Glendive—0 to 2 percent
Elevation: 2,400 to 3,400 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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: Frequent
Available water capacity: Mainly 9.7 inches

Harlem

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: Frequent

Available water capacity: Mainly 9.6 inches

Glendive

Surface layer texture: Fine sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Frequent

Available water capacity: Mainly 9.9 inches

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

Inclusions

- Havre soils that are moderately saline
- Harlem soils that are moderately saline
- Glendive soils that are saline
- Areas of soils that are rarely flooded
- Extremely gravelly, sandy soils
- Somewhat poorly drained soils

Management

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

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

Ivanell Series

The Ivanell series consists of moderately deep, well drained soils on sedimentary plains. These soils formed in residuum derived from semiconsolidated shale. Slope is 2 to 8 percent. Elevation is 2,700 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed Borollic Haplargids

Typical Pedon

Ivanell clay loam, 2 to 8 percent slopes, in an area of rangeland, 1,500 feet east and 1,000 feet south of the northwest corner of sec. 32, T. 9 N., R. 38 E.

E—0 to 3 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; mildly alkaline; abrupt smooth boundary.

Bt—3 to 7 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium and fine angular blocky; hard, friable, sticky and plastic; many very fine roots; common very fine tubular pores; continuous thin clay films on faces of peds and in pores; mildly alkaline; clear smooth boundary.

Btk—7 to 9 inches; light brownish gray (2.5Y 6/2) silty clay loam, light yellowish brown (2.5Y 5/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; common thin clay films on faces of peds; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—9 to 22 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate coarse prismatic structure; very hard, friable, sticky and plastic; common very fine roots; many very fine tubular pores; common fine soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

BC—22 to 37 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, friable, sticky and plastic; common very fine roots; many very fine pores; slightly effervescent; strongly alkaline; gradual smooth boundary.

Cr—37 to 60 inches; light brownish gray (2.5Y 6/2), semiconsolidated shale that textures to silty clay loam, dark grayish brown (2.5Y 4/2) moist; extremely hard, very firm, sticky and plastic; few very fine roots in cracks; common fine soft masses of gypsum; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 6 to 12 inches

Depth to Cr horizon: 20 to 40 inches, commonly 25 to 40 inches

E horizon

Hue: 2.5Y or 10YR

Value: 5 to 7 dry; 3 to 5 moist

Texture: Loam or silt loam; clay loam or silty clay loam when mixed to a depth of 7 inches

Clay content: 27 to 35 percent

Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam or clay loam

Clay content: 27 to 35 percent

Reaction: pH 7.4 to 8.4

Btk and Bk horizons

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam or clay loam

Clay content: 27 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Sodium adsorption ratio: 5 to 10

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 2.5Y or 10YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam or clay loam

Clay content: 27 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 10 to 25

Reaction: pH 7.4 to 9.0

Cr horizon

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 10 to 15

Reaction: pH 7.4 to 9.0

105—Ivanell clay loam, 2 to 8 percent slopes

Composition

Ivanell and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 5.5 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Cambeth soils on shoulders
- Delpoint soils on shoulders
- Davidell soils on foot slopes
- Forelle soils on foot slopes
- Gerdrum soils on foot slopes

Management

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

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

106—Ivanell-Davidell complex, 2 to 8 percent slopes

Composition

Ivanell and similar soils: 40 percent

Davidell and similar soils: 40 percent

Inclusions: 20 percent

Setting

Landform:

- Ivanell—Sedimentary plains
- Davidell—Sedimentary plains

Position on landform:

- Ivanell—Back slopes
- Davidell—Foot slopes

Slope:

- Ivanell—2 to 8 percent
- Davidell—2 to 4 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Ivanell

Surface layer texture: Silty clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 4.4 inches

Davidell

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 a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.5 inches

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

Inclusions

- Cambeth soils on back slopes
- Delpoint soils on back slopes
- Gerdrum soils on foot slopes
- Antwerp soils on foot slopes
- Niler soils on shoulders
- Sumatra soils on shoulders

Management

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

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

107—Ivanell-Niler silty clay loams, 4 to 15 percent slopes

Composition

Ivanell and similar soils: 60 percent

Niler and similar soils: 20 percent

Inclusions: 20 percent

Setting

Landform:

- Ivanell—Sedimentary plains
- Niler—Sedimentary plains

Position on landform:

- Ivanell—Back slopes
- Niler—Shoulders and summits

Slope:

- Ivanell—4 to 8 percent
- Niler—4 to 15 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Ivanell

Surface layer texture: Silty clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 5.2 inches

Niler

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

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

Inclusions

- Cambeth soils on back slopes
- Gerdrum soils on foot slopes
- Lonna soils on foot slopes
- Sumatra soils on shoulders

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Kirby Series

The Kirby series consists of very deep, excessively drained soils on hills. These soils formed in residuum derived from fractured, baked shale and sandstone. Slope is 4 to 70 percent. Elevation is 3,000 to 4,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Loamy-skeletal over fragmental, mixed (calcareous), frigid Ustic Torriorthents

Typical Pedon

Kirby very channery loam, in an area of Armells-Kirby-Cabbart complex, 25 to 70 percent slopes; in an area of rangeland, 700 feet north and 700 feet east of the southwest corner of sec. 35, T. 7 S., R. 42 E.

- A—0 to 4 inches; reddish brown (5YR 5/4) very channery loam, reddish brown (5YR 4/4) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine and very fine roots; 40 percent channers; slightly effervescent; moderately alkaline; clear wavy boundary.
- Bk—4 to 12 inches; reddish brown (5YR 5/4) extremely channery loam, reddish brown (5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots between coarse fragments and matted on top of the coarse fragments; 80 percent channers; common moderately thick lime coatings on coarse fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.
- 2C—12 to 60 inches; light red (2.5YR 6/6), hard, fractured, baked shale, red (2.5YR 5/6) moist; few fine roots in cracks in the upper part; 3 percent fines; shale fragments 2 to 6 inches in length and 1 to 2 inches thick; common thin lime coatings on the lower surfaces of fragments in the upper part.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 8 and 24 inches

Depth to fragmental material: 11 to 20 inches

A horizon

Hue: 5YR or 7.5YR
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 3 to 6
 Clay content: 10 to 22 percent
 Content of rock fragments: 15 to 70 percent—0 to 10 percent flagstones and stones, 15 to 70 percent channers
 Reaction: pH 7.4 to 8.4

Bk horizon

Hue: 5YR or 7.5YR
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 3 to 6
 Texture: Loam or sandy loam
 Clay content: 8 to 22 percent
 Content of rock fragments: 40 to 90 percent—0 to 20 percent flagstones and cobbles, 35 to 80 percent channers
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.9 to 8.4

2C horizon

Hue: 2.5YR to 7.5YR
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 3 to 6
 Clay content: 0 to 1 percent
 Content of rock fragments: 90 to 95 percent flagstones, cobbles, and channers

108—Kirby-Cabbart-Rock outcrop complex, 25 to 70 percent slopes

Composition

Kirby and similar soils: 40 percent
 Cabbart and similar soils: 25 percent
 Rock outcrop: 20 percent
 Inclusions: 15 percent

Setting

Landform:

- Kirby—Hills
- Cabbart—Hills
- Rock outcrop—Hills

Position on landform:

- Kirby—Summits
- Cabbart—Back slopes
- Rock outcrop—Back slopes and shoulders

Slope:

- Kirby—25 to 70 percent
- Cabbart—25 to 70 percent
- Rock outcrop—25 to 70 percent

Elevation: 3,100 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Kirby

Surface layer texture: Very channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 0.9 inch

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.9 inches

Rock outcrop

Definition: Exposures of baked and unbaked siltstone bedrock

Flooding: None

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Armells soils on back slopes
- Yawdim soils on back slopes
- Coopers soils on foot slopes
- Lonna soils on foot slopes
- Yamac soils on foot slopes

Management

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

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

Kobar Series

The Kobar series consists of very deep, well drained and somewhat poorly drained soils on alluvial fans, sedimentary plains, and stream terraces. These soils formed in alluvium. Slope is 0 to 25 percent. Elevation

is 2,400 to 3,900 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic Borollic Camborthids

Typical Pedon

Kobar silty clay loam, 2 to 8 percent slopes, in an area of rangeland, 2,000 feet north and 400 feet west of the southeast corner of sec. 11, T. 5 N., R. 39 E.

A—0 to 7 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, very friable, sticky and plastic; many fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

Bw—7 to 13 inches; light yellowish brown (2.5Y 6/4) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate fine and medium angular blocky; hard, friable, sticky and plastic; many very fine roots and pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Bk1—13 to 23 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2 crushed) moist; moderate medium prismatic structure parting to moderate fine and medium angular blocky; hard, friable, sticky and plastic; common very fine roots; many very fine pores; few fine seams and soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

Bk2—23 to 31 inches; light brownish gray (2.5Y 6/2) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, sticky and plastic; few very fine roots; many very fine pores; few fine soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

Bky—31 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, firm, sticky and plastic; common very fine pores; few fine soft masses of lime and gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 12 to 17 inches

Depth to Bky 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 or silty clay
 Clay content: 27 to 45 percent
 Content of 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 to 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1 to 4
 Texture: Silty clay loam, silty clay, or clay
 Clay content: 35 to 45 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR to 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 1 to 4
 Texture: Silty clay loam, silty clay, or clay
 Clay content: 35 to 45 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR to 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 to 4
 Texture: Silty clay loam, silty clay, or clay
 Clay content: 35 to 45 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Sodium adsorption ratio: 3 to 10
 Reaction: pH 7.9 to 8.4

Bky horizon

Hue: 10YR to 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 1 to 4
 Texture: Silty clay loam, silty clay, or clay
 Clay content: 35 to 45 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Calcium carbonate equivalent: 5 to 15 percent
 Sodium adsorption ratio: 8 to 13
 Content of gypsum: 1 to 5 percent
 Reaction: pH 7.9 to 9.0

109—Kobar silty clay loam, 0 to 2 percent slopes**Composition**

Kobar and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 2,500 to 3,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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 9.7 inches

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

Inclusions

- Gerdrum soils on microlows
- Lonna and similar soils
- Kobar silty clay

Management

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

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

110—Kobar silty clay loam, 2 to 8 percent slopes**Composition**

Kobar and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans
Slope: 2 to 8 percent
Elevation: 2,500 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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 9.7 inches

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

Inclusions

- Gerdrum soils on microlows
- Lonna and similar soils
- Soils that are moderately deep over shale

Management

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

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

111—Kobar silty clay loam, 8 to 15 percent slopes

Composition

Kobar and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Elevation: 2,500 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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 9.7 inches

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

Inclusions

- Lonna and similar soils
- Yamac and similar soils
- Yawdim soils on shoulders
- Soils that are moderately deep over shale

Management

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

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

112—Kobar silty clay loam, gullied, 2 to 15 percent slopes

Composition

Kobar and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Alluvial fans
Slope: 2 to 15 percent
Elevation: 2,500 to 3,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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 9.7 inches

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

Inclusions

- Cambeth and similar soils
- Lonna and similar soils
- Yawdim and similar soils
- Marvan and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

113—Kobar silty clay, 0 to 2 percent slopes

Composition

Kobar and similar soils: 90 percent
Inclusions: 10 percent

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 2,400 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Flooding: None
Available water capacity: Mainly 9.6 inches

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

Inclusions

- Spinekop and similar soils
- Soils that have a surface layer of clay
- Soils that have a substratum of loam

Management

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

- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

114—Kobar silty clay, moderately wet, 0 to 2 percent slopes

Composition

Kobar and similar soils: 90 percent
Inclusions: 10 percent

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 2,400 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Flooding: None
Water table: Apparent
Available water capacity: Mainly 9.8 inches

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

Inclusions

- Zatoville soils that are moderately wet

Management

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

- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

115—Kobar-Cabbart-Yawdim complex, 8 to 25 percent slopes

Composition

Kobar and similar soils: 45 percent
Cabbart and similar soils: 20 percent
Yawdim and similar soils: 15 percent
Inclusions: 20 percent

Setting

Landform:

- Kobar—Alluvial fans
- Cabbart—Hills
- Yawdim—Hills

Position on landform:

- Cabbart—Back slopes and shoulders
- Yawdim—Back slopes and shoulders

Slope:

- Kobar—8 to 15 percent

- Cabbart—8 to 25 percent
- Yawdim—8 to 25 percent

Elevation: 2,600 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Kobar

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 9.7 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.8 inches

Yawdim

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

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

Inclusions

- Cambeth soils on back slopes
- Delpoint soils on back slopes
- Lonna soils on foot slopes
- Yamac soils on foot slopes
- Areas of rock outcrop

Management

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

- "Range" section
- "Agronomy" section
- "Recreation" section

- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Kremlin Series

The Kremlin series consists of very deep, well drained soils on alluvial fans and stream terraces. These soils formed in alluvium. Slope is 0 to 8 percent. Elevation is 2,500 to 3,800 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Aridic Haploborolls

Typical Pedon

Kremlin loam, 2 to 8 percent slopes, in an area of rangeland, 60 feet south and 380 feet west of the northeast corner of sec. 30, T. 6 N., R. 42 E.

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

Bw—8 to 13 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate medium and coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; mildly alkaline; clear smooth boundary.

Bk1—13 to 21 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; moderate medium prismatic structure; hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; few medium soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—21 to 30 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC—30 to 60 inches; grayish brown (2.5YR 5/2) loam, dark grayish brown (2.5YR 4/2) moist; massive; slightly hard, friable, nonsticky and nonplastic; few very fine roots; many very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in some part 60 percent or more of the cumulative days per year when the soil

temperature at a depth of 20 inches is 41 degrees F or higher

Mollic epipedon thickness: 7 to 15 inches

Depth to Bk horizon: 10 to 24 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 2 or 3 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.1 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.6 to 7.8

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

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

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 15 percent

Effervescence: Strong or violent

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 10YR to 5Y

Value: 6 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, silt loam, clay loam, or sandy clay loam that has thin layers of different textures

Clay content: 18 to 32 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 5 to 12 percent

Effervescence: Strong or violent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

BC horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, silt loam, clay loam, or sandy clay loam that has thin layers of different textures

Clay content: 18 to 30 percent

Content of rock fragments: 0 to 5 percent pebbles

Calcium carbonate equivalent: 3 to 12 percent

Effervescence: Strong or violent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

116—Kremlin loam, 0 to 2 percent slopes

Composition

Kremlin and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 2,500 to 3,800 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 10.3 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Chinook and similar soils
- Floweree and similar soils
- Ponded soils

Management

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

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

117—Kremlin loam, 2 to 8 percent slopes

Composition

Kremlin and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Alluvial fans

Slope: 2 to 8 percent

Elevation: 2,500 to 3,800 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 10.2 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Chinook and similar soils
- Floweree and similar soils

Management

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

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

Lamedeer Series

The Lamedeer series consists of very deep, well drained soils on hills. These soils formed in colluvium or material weathered from baked sandstone and shale. Slope is 4 to 70 percent. Elevation is 3,000 to 4,500 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 120 days.

Taxonomic Class: Loamy-skeletal, mixed, frigid Udic Ustochrepts

Typical Pedon

Lamedeer channery loam, in an area of Lamedeer-Lamedeer, dry-Ringling channery loams, 35 to 70 percent slopes; in an area of woodland, 1,900 feet west and 2,100 feet north of the southeast corner of sec. 4, T. 4 S., R. 42 E.

Oi—2 inches to 0; pine needles and twigs.

A—0 to 8 inches; reddish brown (5YR 4/3) channery loam, dark reddish brown (5YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common coarse, medium, and fine roots; 20 percent channers; neutral; clear wavy boundary.

Bw1—8 to 20 inches; reddish brown (5YR 5/3) channery loam, reddish brown (5YR 4/3) moist; weak fine and very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common coarse, medium, and fine roots; 20 percent channers; mildly alkaline; clear wavy boundary.

Bw2—20 to 36 inches; reddish brown (5YR 5/3) very channery loam, reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common coarse and medium roots; 40 percent channers and 15 percent flagstones; mildly alkaline; clear wavy boundary.

Bk—36 to 60 inches; reddish brown (5YR 5/3) extremely channery sandy loam, reddish brown (5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; common coarse and medium roots; 45 percent channers and 20 percent flagstones; common moderately thick lime coatings on the lower surfaces of coarse fragments; slightly effervescent; mildly alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 30 to 40 inches

A horizon

Hue: 5YR or 7.5YR

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 12 to 23 percent

Content of rock fragments: 15 to 35 percent channers

Reaction: pH 6.1 to 7.3

Bw1 horizon

Hue: 5YR or 7.5YR

Value: 5 or 6 dry; 4 moist

Chroma: 3 or 4

Clay content: 15 to 25 percent

Content of rock fragments: 20 to 70 percent—15 to 20 percent flagstones, 15 to 50 percent channers

Reaction: pH 6.6 to 7.8

Bw2 horizon

Hue: 5YR or 7.5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 3 or 4

Texture: Loam or sandy loam
 Clay content: 8 to 20 percent
 Content of rock fragments: 50 to 70 percent—5 to 15 percent flagstones, 35 to 45 percent channers
 Reaction: pH 7.4 to 7.8

Bk horizon

Hue: 5YR or 7.5YR
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 2 to 4
 Texture: Loam or sandy loam
 Clay content: 8 to 20 percent
 Content of rock fragments: 50 to 70 percent—15 to 25 percent flagstones, 35 to 45 percent channers
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

118—Lamedeer-Lamedeer, dry-Ringling channery loams, 35 to 70 percent slopes

Composition

Lamedeer and similar soils: 40 percent
 Lamedeer, dry, and similar soils: 30 percent
 Ringling and similar soils: 20 percent
 Inclusions: 10 percent

Setting

Landform:

- Lamedeer—Hills
- Lamedeer, dry—Hills
- Ringling—Hills

Position on landform:

- Lamedeer—Back slopes
- Lamedeer, dry—Back slopes and foot slopes
- Ringling—Summits

Slope:

- Lamedeer—35 to 70 percent, north aspect
- Lamedeer, dry—35 to 70 percent, south aspect
- Ringling—35 to 70 percent

Elevation: 3,800 to 4,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Lamedeer

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.5 inches

Lamedeer, dry

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 4.1 inches

Ringling

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Material weathered from baked sandstone and shale
Native plant cover type: Forest land
Flooding: None
Available water capacity: Mainly 1.7 inches

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

Inclusions

- Twin Creek soils that are moist
- Areas of rock outcrop

Management

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

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

119—Lamedeer-Twin Creek, moist-Ringling complex, 4 to 15 percent slopes

Composition

Lamedeer and similar soils: 45 percent
 Twin Creek and similar soils: 30 percent
 Ringling and similar soils: 15 percent
 Inclusions: 10 percent

Setting

Landform:

- Lamedeer—Hills
- Twin Creek—Alluvial fans
- Ringling—Hills

Position on landform:

- Lamedeer—Back slopes
- Ringling—Summits

Slope:

- Lamedeer—4 to 15 percent
- Twin Creek—4 to 8 percent
- Ringling—4 to 15 percent

Elevation: 3,800 to 4,500 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 100 to 115 days**Component Description****Lamedeer***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 4.4 inches**Twin Creek***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 9.6 inches**Ringling***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Excessively drained*Dominant parent material:* Material weathered from baked sandstone and shale*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 1.7 inches

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

Inclusions

- Fergus variant soils on fans
- Ringling soils that have boulders

Management

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

- "Range" section
- "Forest Land" section

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

120—Lamedeer-Twin Creek, moist-Ringling complex, 15 to 35 percent slopes**Composition**

Lamedeer and similar soils: 50 percent

Twin Creek and similar soils: 25 percent

Ringling and similar soils: 15 percent

Inclusions: 10 percent

Setting*Landform:*

- Lamedeer—Hills
- Twin Creek—Alluvial fans
- Ringling—Hills

Position on landform:

- Lamedeer—Back slopes and foot slopes
- Twin Creek—Foot slopes
- Ringling—Summits

Slope:

- Lamedeer—15 to 35 percent
- Twin Creek—15 to 25 percent
- Ringling—15 to 35 percent

Elevation: 3,800 to 4,500 feet*Mean annual precipitation:* 15 to 19 inches*Frost-free period:* 100 to 115 days**Component Description****Lamedeer***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Forest land*Flooding:* None*Available water capacity:* Mainly 4.3 inches**Twin Creek***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 9.6 inches**Ringling***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 1.8 inches

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

Inclusions

- Barvon soils on back slopes
- Fergus variant soils on fans
- Areas of rock outcrop
- Ringling soils that have boulders

Management

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

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

121—Lamedeer, dry-Bitton, moist-Ringling, dry, channery loams, 25 to 70 percent slopes

Composition

Lamedeer and similar soils: 50 percent

Bitton and similar soils: 20 percent

Ringling and similar soils: 15 percent

Inclusions: 15 percent

Setting

Landform:

- Lamedeer—Hills
- Bitton—Hills
- Ringling—Hills

Position on landform:

- Lamedeer—Back slopes and foot slopes
- Bitton—Back slopes and foot slopes
- Ringling—Summits

Slope:

- Lamedeer—25 to 70 percent, north aspect
- Bitton—25 to 70 percent, south aspect
- Ringling—25 to 70 percent

Elevation: 3,300 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Lamedeer

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.5 inches

Bitton

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 5.2 inches

Ringling

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Material weathered from baked sandstone and shale

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

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

Inclusions

- Barvon soils on back slopes
- Cabba soils on shoulders
- Shambo soils on foot slopes

Management

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

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

Lihen Series

The Lihen series consists of very deep, well drained soils on hills. These soils formed in alluvium. Slope is

15 to 35 percent. Elevation is 3,300 to 3,500 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 43 degrees F, and the frost-free period is 105 to 120 days.

Taxonomic Class: Sandy, mixed Entic Haploborolls

Typical Pedon

Lihen sandy loam, 15 to 35 percent slopes, in an area of rangeland, 2,000 feet west and 800 feet north of the southeast corner of sec. 29, T. 4 N., R. 39 E.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 5 percent pebbles; slightly acid; clear smooth boundary.

A2—4 to 7 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine roots; common fine pores; 5 percent pebbles; neutral; clear wavy boundary.

AC—7 to 14 inches; brown (10YR 5/3) loamy sand, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common fine pores; 10 percent pebbles; neutral; clear wavy boundary.

C—14 to 60 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; 10 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 12 and 35 inches

Mollic epipedon thickness: 12 to 30 inches

A and AC horizons

Hue: 10YR or 2.5Y

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 20 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.1 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Texture: Loamy fine sand, loamy sand, fine sand, or sand

Clay content: 0 to 10 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 0 to 12 percent

Reaction: pH 6.6 to 8.4

122—Lihen sandy loam, 15 to 35 percent slopes

Composition

Lihen and similar soils: 90 percent

Inclusions: 10 percent

Setting

Landform: Hills

Slope: 15 to 35 percent

Elevation: 3,300 to 3,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.3 inches

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

Inclusions

- Tinsley soils on summits
- Very deep soils that have a surface layer of sandy loam
- Areas of soils that have slopes of less than 15 percent

Management

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

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

Lonna Series

The Lonna series consists of very deep, well drained soils on alluvial fans, stream terraces, and sedimentary plains. These soils formed in alluvium. Slope is 0 to 15 percent. Elevation is 2,500 to 3,800 feet. The average

annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed Borollic Camborthids

Typical Pedon

Lonna silt loam, in an area of Lonna-Cambeth silt loams, 2 to 8 percent slopes; in an area of cropland; 500 feet north and 1,400 feet east of the southwest corner of sec. 19, T. 12 N., R. 44 E.

Ap—0 to 5 inches; brown (10YR 5/3) silt loam, brown (10YR 4/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

Bw—5 to 10 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—10 to 17 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; common fine seams and soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—17 to 30 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; common fine seams and soft masses of lime; violently effervescent; strongly alkaline; gradual smooth boundary.

BC—30 to 60 inches; pale yellow (2.5Y 7/4) silt loam, light yellowish brown (2.5Y 6/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the

soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 10 to 12 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Effervescence: Slight or strong

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Effervescence: Slight or strong

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 6.6 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 12 percent

Electrical conductivity: 0 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 13

Effervescence: Strong or violent

Reaction: pH 7.9 to 8.4

Bk2 horizon

Hue: 10YR or 2.5Y

Value: 5 to 8 dry; 4 to 7 moist

Chroma: 2 to 4

Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 8 mmhos/cm

Sodium adsorption ratio: 1 to 13

Effervescence: Strong or violent

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Very fine sandy loam, loam, silt loam, or silty clay loam; stratified in some pedons

Clay content: 10 to 35 percent

Electrical conductivity: 2 to 16 mmhos/cm

Sodium adsorption ratio: 1 to 20

Effervescence: Strong or violent

Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

123—Lonna silt loam, 0 to 2 percent slopes

Composition

Lonna and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 2,600 to 3,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

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

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

Inclusions

- Busby and similar soils
- Kobar and similar soils
- Yamac and similar soils
- Lonna silty clay loam

Management

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

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

124—Lonna silt loam, 2 to 8 percent slopes

Composition

Lonna and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 2,600 to 3,800 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

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

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

Inclusions

- Busby and similar soils
- Kobar and similar soils
- Yamac and similar soils
- Lonna silty clay loam

Management

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

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

125—Lonna silt loam, 8 to 15 percent slopes

Composition

Lonna and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Elevation: 2,600 to 3,800 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

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

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.4 inches

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

Inclusions

- Busby and similar soils
- Kobar and similar soils
- Yamac and similar soils
- Lonna silty clay loam

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

126—Lonna silty clay loam, 0 to 2 percent slopes

Composition

Lonna and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 2 percent
Elevation: 2,500 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as

horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Gerdrum soils on microlows
- Kobar and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

127—Lonna silty clay loam, 2 to 8 percent slopes

Composition

Lonna and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans
Slope: 2 to 8 percent
Elevation: 2,500 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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 10.0 inches

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

Inclusions

- Gerdrum soils on microlows
- Kobar and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

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

Composition

Lonna and similar soils: 70 percent
Alona and similar soils: 20 percent
Inclusions: 10 percent

Setting

Landform:

- Lonna—Alluvial fans and stream terraces
- Alona—Alluvial fans and stream terraces

Slope:

- Lonna—0 to 2 percent
- Alona—0 to 2 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Lonna

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.1 inches

Alona

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 7.3 inches

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

Inclusions

- Antwerp and similar soils
- Lonna silty clay loam

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

129—Lonna-Alona silt loams, 2 to 8 percent slopes

Composition

Lonna and similar soils: 65 percent
Alona and similar soils: 20 percent
Inclusions: 15 percent

Setting

Landform:

- Lonna—Alluvial fans
- Alona—Alluvial fans

Slope:

- Lonna—2 to 8 percent
- Alona—2 to 8 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Lonna

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Alona

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 7.2 inches

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as

horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Lonna silty clay loam
- Areas of soils that have slopes of less than 2 percent

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

130—Lonna-Antwerp silty clay loams, 0 to 2 percent slopes

Composition

Lonna and similar soils: 70 percent
Antwerp and similar soils: 20 percent
Inclusions: 10 percent

Setting

Landform:

- Lonna—Alluvial fans and stream terraces
- Antwerp—Alluvial fans and stream terraces

Position on landform:

- Lonna—Microhighs
- Antwerp—Microlows

Slope:

- Lonna—0 to 2 percent
- Antwerp—0 to 2 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Lonna

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 10.3 inches

Antwerp

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 7.0 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Davidell and similar soils
- Gerdrum and similar soils
- Kobar and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

131—Lonna-Antwerp silty clay loams, 2 to 8 percent slopes

Composition

Lonna and similar soils: 65 percent
Antwerp and similar soils: 20 percent
Inclusions: 15 percent

Setting

Landform:

- Lonna—Alluvial fans
- Antwerp—Alluvial fans

Slope:

- Lonna—2 to 8 percent
- Antwerp—2 to 4 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Lonna

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 9.9 inches

Antwerp

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.8 inches

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

Inclusions

- Davidell and similar soils
- Gerdrum and similar soils
- Kobar and similar soils
- Lonna silt loam

Management

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

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

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

Composition

Lonna and similar soils: 50 percent

Cabbart and similar soils: 20 percent

Yawdim and similar soils: 15 percent

Inclusions: 15 percent

Setting

Landform:

- Lonna—Alluvial fans
- Cabbart—Hills
- Yawdim—Hills

Position on landform:

- Cabbart—Shoulders and summits
- Yawdim—Back slopes and shoulders

Slope:

- Lonna—8 to 15 percent

- Cabbart—8 to 25 percent

- Yawdim—8 to 25 percent

Elevation: 2,600 to 3,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Lonna

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 10.0 inches

Cabbart

Surface layer texture: Silt loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.1 inches

Yawdim

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

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

Inclusions

- Busby soils on foot slopes
- Kobar soils on foot slopes
- Yamac soils on foot slopes
- Cambeth soils on back slopes

Management

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

- "Range" section
- "Agronomy" section
- "Recreation" section

- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

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

Composition

Lonna and similar soils: 55 percent
Cambeth and similar soils: 40 percent
Inclusions: 5 percent

Setting

Landform:

- Lonna—Sedimentary plains
- Cambeth—Sedimentary plains

Position on landform:

- Lonna—Back slopes and foot slopes
- Cambeth—Back slopes and shoulders

Slope:

- Lonna—2 to 8 percent
- Cambeth—2 to 8 percent

Elevation: 2,700 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Lonna

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.9 inches

Cambeth

Surface layer texture: Silt loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.5 inches

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

Inclusions

- Cabbart soils on shoulders

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Louscot Series

The Louscot series consists of very deep, well drained soils on alluvial fans. These soils formed in alluvium. Slope is 0 to 4 percent. Elevation is 2,800 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed, acid, frigid Ustic Torriorthents

Typical Pedon

Louscot silt loam, 0 to 4 percent slopes, in an area of rangeland, 800 feet south and 600 feet east of the northwest corner of sec. 29, T. 11 N., R. 39 E.

- A1—0 to 1 inch; light brownish gray (10YR 6/2) silt loam, dark gray (10YR 4/1) moist; vesicular crust; slightly hard, very friable, sticky and plastic; few fine roots; many very fine vesicular pores; medium acid; abrupt smooth boundary.
- A2—1 to 4 inches; grayish brown (10YR 5/2) silt loam, dark gray (10YR 4/1) moist; weak thin platy structure; slightly hard, very friable, sticky and plastic; many fine roots; few fine tubular pores; medium acid; clear smooth boundary.
- C1—4 to 14 inches; grayish brown (10YR 5/2) silt loam, dark gray (10YR 4/1) moist; moderate thin platy structure; slightly hard, very friable, sticky and plastic; many fine roots; few fine tubular pores; very strongly acid; clear smooth boundary.
- C2—14 to 22 inches; grayish brown (10YR 5/2) silty clay loam, dark gray (10YR 4/1) moist; massive; slightly hard, very friable, sticky and plastic; common fine roots; very strongly acid; clear smooth boundary.
- C3—22 to 34 inches; grayish brown (10YR 5/2) silt loam, dark gray (10YR 4/1) moist; massive; slightly hard, very friable, sticky and plastic; few fine roots; very strongly acid; clear smooth boundary.
- C4—34 to 60 inches; grayish brown (10YR 5/2) silt loam, dark gray (10YR 4/1) moist; massive; slightly hard, very friable, sticky and plastic; strongly acid.

Range in Characteristics

Soil temperature: 45 to 48 degrees F

Moisture control section: Between the depths of 4 and 12 inches

A horizon

Value: 5 or 6 dry; 4 moist

Chroma: 1 or 2

Clay content: 20 to 27 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 4.5 to 6.5

C horizon

Value: 5 dry; 3 or 4 moist

Chroma: 1 or 2

Texture: Silt loam or silty clay loam

Clay content: 20 to 35 percent

Electrical conductivity: 4 to 16 mmhos/cm

Reaction: pH 3.6 to 5.5

134—Louscot silt loam, 0 to 4 percent slopes

Composition

Louscot and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Alluvial fans

Slope: 0 to 4 percent

Elevation: 2,800 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Available water capacity: Mainly 8.6 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Gerdrum and similar soils
- Volborg and similar soils

Management

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

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

Macar Series

The Macar series consists of very deep, well drained soils on hills. These soils formed in colluvium. Slope is 15 to 25 percent. Elevation is 4,400 to 4,900 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 115 days.

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

Typical Pedon

Macar loam, in an area of Macar-Doney-Rock outcrop complex, 15 to 45 percent slopes; in an area of rangeland, 1,400 feet east and 20 feet north of the southwest corner of sec. 28, T. 5 S., R. 39 E.

A—0 to 3 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak thin platy structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; moderately alkaline; clear wavy boundary.

Bw—3 to 12 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate medium and fine subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; slightly effervescent; moderately alkaline; clear wavy boundary.

Bk1—12 to 18 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate medium and fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots and pores; common masses and threads of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—18 to 28 inches; very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) moist; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine pores; few masses and threads of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—28 to 60 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots and pores; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 11 to 24 inches

A horizon

Hue: 10YR to 5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 30 percent—0 to 5 percent cobbles, 0 to 25 percent pebbles

Effervescence: None to slight

Electrical conductivity: 0 to 2 mmhos/cm

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 to 6

Texture: Loam, clay loam, or silty clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 5 percent pebbles

Effervescence: None to slight

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 6

Texture: Clay loam, loam, or silty clay loam

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 5 percent pebbles

Effervescence: Slight or strong

Calcium carbonate equivalent: 8 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

Bk2 horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 6

Texture: Clay loam, loam, silt loam, sandy clay loam, or silty clay loam; fine strata of sandy loam and fine sandy loam in some pedons

Note: 35 to 55 percent of the sand is fine or coarser.

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 10 percent pebbles

Effervescence: Strong or violent

Calcium carbonate equivalent: 8 to 15 percent

Electrical conductivity: 0 to 16 mmhos/cm

Reaction: pH 7.4 to 9.0

BC horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 6

Texture: Loam, silt loam, or silty clay loam

Clay content: 15 to 30 percent

Content of rock fragments: 0 to 10 percent pebbles

Effervescence: Strong or violent

Calcium carbonate equivalent: 5 to 12 percent

Electrical conductivity: 0 to 16 mmhos/cm

Reaction: pH 7.9 to 9.0

135—Macar-Doney-Rock outcrop complex, 15 to 45 percent slopes

Composition

Macar and similar soils: 40 percent

Doney and similar soils: 20 percent

Rock outcrop: 20 percent

Inclusions: 20 percent

Setting

Landform:

- Macar—Hills
- Doney—Hills
- Rock outcrop—Hills

Position on landform:

- Macar—Foot slopes
- Doney—Back slopes
- Rock outcrop—Shoulders and summits

Slope:

- Macar—15 to 25 percent
- Doney—25 to 45 percent
- Rock outcrop—15 to 45 percent

Elevation: 4,400 to 4,900 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Macar

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Available water capacity: Mainly 9.1 inches

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.4 inches

Rock outcrop

Definition: Exposures of siltstone bedrock

Flooding: None

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

Inclusions

- Bryant soils on foot slopes
- Sagedale soils on foot slopes
- Shambo soils on foot slopes
- Cabba soils on shoulders

Management

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

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

Marmarth Series

The Marmarth series consists of moderately deep, well drained soils on sedimentary plains and hills. These soils formed in semiconsolidated, loamy sedimentary beds. Slope is 1 to 8 percent. Elevation is 2,600 to 3,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Aridic Argiborolls

Typical Pedon

Marmarth fine sandy loam, 2 to 8 percent slopes, in an area of rangeland, 200 feet north and 2,300 feet west of the southeast corner of sec. 12, T. 7 N., R. 39 E.

A1—0 to 1 inch; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist;

very weak thin platy structure parting to weak very fine granular; soft, loose, nonsticky and nonplastic; many very fine roots; few very fine pores; neutral; abrupt smooth boundary.

A2—1 to 4 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium platy structure parting to weak very fine granular; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; few fine pores; neutral; abrupt smooth boundary.

Bt—4 to 13 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; continuous thin clay films on faces of peds and in pores; mildly alkaline; clear wavy boundary.

Bk—13 to 24 inches; light yellowish brown (2.5Y 6/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common soft masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

Cr—24 to 60 inches; light yellowish brown (2.5Y 6/4), semiconsolidated, loamy sedimentary beds that texture to fine sandy loam, olive brown (2.5Y 4/4) moist; hard, friable, nonsticky and nonplastic; few fine roots in cracks in the upper 4 inches; few iron stains (7.5YR 5/8); strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 10 to 20 inches

Depth to Cr horizon: 20 to 40 inches

Mollic epipedon thickness: 11 to 16 inches

A horizon

Value: 3 to 5 moist

Chroma: 2 or 3

Clay content: 10 to 18 percent

Reaction: pH 6.1 to 7.3

Bt horizon

Hue: 10YR or 2.5Y

Value: 3 to 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or sandy clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.1 to 7.8

Bk horizon

Hue: 2.5Y or 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4
 Texture: Loam, fine sandy loam, or clay loam
 Clay content: 15 to 30 percent
 Effervescence: Strong or violent
 Calcium carbonate equivalent: 5 to 15 percent
 Reaction: pH 7.4 to 8.4

136—Marmarth fine sandy loam, 2 to 8 percent slopes

Composition

Marmarth and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Elevation: 2,600 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

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

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

Inclusions

- Busby and similar soils
- Galbreth soils on shoulders
- Rominell and similar soils

Management

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

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

137—Marmarth-Galbreth complex, 2 to 15 percent slopes

Composition

Marmarth and similar soils: 50 percent
 Galbreth and similar soils: 35 percent
 Inclusions: 15 percent

Setting

Landform:
 • Marmarth—Hills
 • Galbreth—Hills
Position on landform:
 • Marmarth—Back slopes and foot slopes
 • Galbreth—Back slopes and shoulders
Slope:
 • Marmarth—2 to 8 percent
 • Galbreth—2 to 15 percent
Elevation: 2,600 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Marmarth

Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.6 inches

Galbreth

Surface layer texture: Sandy clay 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 1.9 inches

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

Inclusions

- Blackhall and similar soils
- Bonfri and similar soils
- Chinook and similar soils
- Bullock and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Marvan Series

The Marvan series consists of very deep and deep, well drained soils on sedimentary plains, alluvial fans, and stream terraces. These soils formed in alluvium. Slope is 0 to 8 percent. Elevation is 2,600 to 3,300 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic, frigid Udorthentic Chromusterts

Typical Pedon

Marvan silty clay, 0 to 2 percent slopes, in an area of rangeland, 30 feet west and 500 feet south of the northeast corner of sec. 19, T. 10 N., R. 34 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate fine granular structure; soft, firm, sticky and plastic; many very fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bss1—3 to 15 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure; very hard, very firm, sticky and very plastic; many very fine roots and pores; few slickensides; strongly effervescent; strongly alkaline; clear irregular boundary.

Bss2—15 to 21 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak angular blocky structure; very hard, very firm, sticky and very plastic; common very fine roots and pores; few slickensides; strongly effervescent; strongly alkaline; clear irregular boundary.

Bky—21 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, very firm, sticky and very plastic; few very fine roots; common very fine pores; common fine and medium masses of lime and gypsum; strongly effervescent; strongly alkaline; gradual wavy boundary.

Byz—30 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive;

hard, very firm, sticky and very plastic; few fine roots; common very fine pores; few fine soft masses of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to bedrock: 40 to 60 inches or more

A horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 40 to 60 percent

Electrical conductivity: 0 to 4 mmhos/cm

Calcium carbonate equivalent: 1 to 5 percent

Reaction: pH 7.4 to 8.4

Bss horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay or silty clay

Clay content: 45 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 4 to 13

Calcium carbonate equivalent: 1 to 10 percent

Reaction: pH 7.9 to 9.0

Bky horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay or silty clay

Clay content: 45 to 60 percent

Content of gypsum: 1 to 5 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 38

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 9.0

Byz horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Clay or silty clay

Clay content: 45 to 60 percent

Content of gypsum: 1 to 5 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 38

Calcium carbonate equivalent: 1 to 10 percent

Reaction: pH 7.9 to 9.0

138—Marvan silty clay, 0 to 2 percent slopes**Composition**

Marvan and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 2,600 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 6.7 inches

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

Inclusions

- Gerdrum and similar soils
- Vaeda and similar soils

Management

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

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

139—Marvan silty clay, 2 to 8 percent slopes**Composition**

Marvan and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans

Slope: 2 to 8 percent
Elevation: 2,600 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 6.7 inches

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

Inclusions

- Gerdrum and similar soils
- Vaeda and similar soils

Management

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

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

140—Marvan silty clay, saline, 2 to 8 percent slopes**Composition**

Marvan and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Elevation: 2,800 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay
Depth class: Deep (40 to 60 inches)
Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.4 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Abor and similar soils
- Gerdrum and similar soils
- Vaeda soils in concave areas

Management

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

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

Neldore Series

The Neldore series consists of shallow, well drained soils on hills. These soils formed in residuum derived from semiconsolidated shale. Slope is 2 to 60 percent. Elevation is 2,500 to 3,300 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Clayey, montmorillonitic, nonacid, frigid, shallow Ustic Torriorthents

Typical Pedon

Neldore silty clay, 4 to 25 percent slopes, in an area of rangeland, 2,300 feet south and 1,100 feet east of the northwest corner of sec. 25, T. 7 N., R. 39 E.

A1—0 to 1 inch; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate very coarse granular structure parting to moderate fine granular; slightly hard, friable, sticky and plastic; common very fine roots; mildly alkaline; abrupt smooth boundary.

A2—1 to 2 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; hard, firm, sticky and

very plastic; common very fine roots; many very fine pores; mildly alkaline; abrupt wavy boundary.

C1—2 to 7 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, very firm, sticky and very plastic; common very fine roots; many very fine pores; mildly alkaline; gradual smooth boundary.

C2—7 to 12 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and very plastic; common very fine roots; many very fine pores; 50 percent soft shale fragments; mildly alkaline; clear smooth boundary.

Cr—12 to 60 inches; gray (10YR 5/1), semiconsolidated shale, dark grayish brown (10YR 4/2) moist; medium acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to shale: 10 to 20 inches

A horizon

Hue: 10YR to 5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 1 or 2

Clay content: 40 to 60 percent

Content of rock fragments: 0 to 10 percent—0 to 5 percent stones and cobbles, 0 to 5 percent pebbles

Electrical conductivity: Less than 2 mmhos/cm; 2 to 4 mmhos/cm in the saline phase

Reaction: pH 5.6 to 7.8

C1 horizon

Hue: 10YR to 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

Electrical conductivity: 0 to 4 mmhos/cm; 4 to 8 mmhos/cm for the saline phase

Reaction: pH 5.6 to 7.8; pH 7.4 to 8.4 for the saline phase

C2 horizon

Hue: 10YR to 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 or 2

Texture: Clay or silty clay

Clay content: 40 to 60 percent

Electrical conductivity: 0 to 8 mmhos/cm; 4 to 8 mmhos/cm for the saline phase

Content of rock fragments: 50 to 90 percent—50 to 75 percent soft shale fragments, 0 to 15 percent hard shale fragments

Reaction: pH 5.6 to 7.8; pH 7.4 to 8.4 for the saline phase

Cr horizon

Material: Semiconsolidated shale; the shale fragments are extremely hard or very hard when dry and extremely firm or very firm when moist.

Reaction: pH 5.1 to 7.3

141—Neldore silty clay, 4 to 25 percent slopes

Composition

Neldore and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Hills

Slope: 4 to 25 percent

Elevation: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Abor soils on back slopes
- Marvan soils on foot slopes
- Vaeda soils on foot slopes
- Areas of rock outcrop

Management

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

- "Range" section
- "Agronomy" section
- "Recreation" section

- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

142—Neldore-Abor silty clays, 8 to 25 percent slopes

Composition

Neldore and similar soils: 50 percent

Abor and similar soils: 40 percent

Inclusions: 10 percent

Setting

Landform:

- Neldore—Hills

- Abor—Hills

Position on landform:

- Neldore—Back slopes and shoulders

- Abor—Back slopes

Slope:

- Neldore—8 to 25 percent

- Abor—8 to 25 percent

Elevation: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.2 inches

Abor

Surface layer texture: Silty clay

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 5.4 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Marvan soils on foot slopes
- Vaeda soils on foot slopes

- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

143—Neldore-Abor silty clays, 25 to 60 percent slopes

Composition

Neldore and similar soils: 50 percent

Abor and similar soils: 30 percent

Inclusions: 20 percent

Setting

Landform:

- Neldore—Hills
- Abor—Hills

Position on landform:

- Neldore—Back slopes and shoulders
- Abor—Back slopes

Slope:

- Neldore—25 to 60 percent
- Abor—25 to 45 percent

Elevation: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

Abor

Surface layer texture: Silty clay

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Armells soils on summits
- Tinsley soils on summits
- Gerdrum soils on foot slopes
- Marvan soils on foot slopes
- Vaeda soils on foot slopes
- Areas of rock outcrop

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

144—Neldore-Abor-Rock outcrop complex, 8 to 35 percent slopes

Composition

Neldore and similar soils: 40 percent

Abor and similar soils: 25 percent

Rock outcrop: 15 percent

Inclusions: 20 percent

Setting

Landform:

- Neldore—Hills
- Abor—Hills
- Rock outcrop—Hills

Position on landform:

- Neldore—Back slopes and shoulders
- Abor—Back slopes
- Rock outcrop—Shoulders and summits

Slope:

- Neldore—8 to 35 percent
- Abor—8 to 25 percent
- Rock outcrop—8 to 35 percent

Elevation: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

Abor

Surface layer texture: Silty clay

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

Rock outcrop

Definition: Exposures of shale bedrock

Flooding: None

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Gerdrum soils on foot slopes
- Marvan soils on foot slopes
- Vaeda soils on foot slopes
- Yamac soils on foot slopes

Management

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

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

145—Neldore-Neldore, saline, silty clays, 4 to 15 percent slopes

Composition

Neldore and similar soils: 45 percent

Neldore, saline, and similar soils: 35 percent

Inclusions: 20 percent

Setting

Landform:

- Neldore—Hills

- Neldore, saline—Hills

Position on landform:

- Neldore—Back slopes and shoulders

- Neldore, saline—Back slopes and foot slopes

Slope:

- Neldore—4 to 15 percent

- Neldore, saline—4 to 8 percent

Elevation: 2,600 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Neldore, saline

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.6 inches

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

Inclusions

- Vaeda soils on foot slopes
- Abor soils on foot slopes
- Loamy soils that are strongly saline
- Soils that are very strongly saline

Management

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

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

146—Neldore-Rock outcrop complex, 15 to 60 percent slopes

Composition

Neldore and similar soils: 45 percent
 Rock outcrop: 30 percent
 Inclusions: 25 percent

Setting

Landform:

- Neldore—Hills
- Rock outcrop—Hills

Slope:

- Neldore—15 to 60 percent
- Rock outcrop—15 to 60 percent

Elevation: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

Rock outcrop

Definition: Exposures of shale bedrock

Flooding: None

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

Inclusions

- Abor soils on back slopes
- Cabbart soils on summits
- Gerdrum soils on foot slopes
- Marvan soils on foot slopes
- Vaeda soils on foot slopes
- Gravelly soils on summits

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section

- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

147—Neldore-Ustic Torriorthents, strongly saline-Neldore, saline, complex, 2 to 25 percent slopes

Composition

Neldore and similar soils: 45 percent
 Ustic Torriorthents and similar soils: 25 percent
 Neldore, saline, and similar soils: 15 percent
 Inclusions: 15 percent

Setting

Landform:

- Neldore—Hills
- Ustic Torriorthents—Hills
- Neldore, saline—Hills

Position on landform:

- Neldore—Back slopes
- Ustic Torriorthents—Summits
- Neldore, saline—Foot slopes

Slope:

- Neldore—2 to 25 percent
- Ustic Torriorthents—2 to 15 percent
- Neldore, saline—2 to 8 percent

Elevation: 2,600 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

Ustic Torriorthents

Drainage class: Well drained

Dominant parent material: Alluvium or residuum

Flooding: None

Neldore, saline

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.8 inches

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

Inclusions

- Abor and similar soils
- Niler and similar soils
- Vaeda soils on foot slopes

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

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

Composition

Neldore and similar soils: 50 percent

Volborg and similar soils: 35 percent

Inclusions: 15 percent

Setting

Landform:

- Neldore—Hills
- Volborg—Hills

Slope:

- Neldore—4 to 25 percent
- Volborg—4 to 25 percent

Elevation: 2,800 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

Volborg

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Flooding: None

Available water capacity: Mainly 1.3 inches

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

Inclusions

- Abor soils on back slopes
- Vaeda soils on foot slopes
- Loamy soils that are strongly saline
- Areas of rock outcrop on summits

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

149—Neldore-Yawdim silty clays, 8 to 45 percent slopes

Composition

Neldore and similar soils: 45 percent

Yawdim and similar soils: 35 percent

Inclusions: 20 percent

Setting

Landform:

- Neldore—Hills
- Yawdim—Hills

Position on landform:

- Neldore—Back slopes
- Yawdim—Shoulders and summits

Slope:

- Neldore—8 to 45 percent
- Yawdim—8 to 45 percent

Elevation: 2,900 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.3 inches

Yawdim

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Abor soils on back slopes
- Marvan soils on foot slopes
- Vaeda soils on foot slopes
- Strongly saline soils
- Very shallow, clayey soils

Management

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

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

Niler Series

The Niler series consists of shallow, well drained soils on sedimentary plains and hills. These soils formed in residuum derived from semiconsolidated shale. Slope is 2 to 35 percent. Elevation is 2,700 to 3,200 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents

Typical Pedon

Niler silty clay loam, 4 to 35 percent slopes, in an area of rangeland, 100 feet north and 1,800 feet east of the southwest corner of sec. 17, T. 9 N., R. 39 E.

A—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak thin platy structure parting to moderate fine granular; slightly hard, firm, sticky and plastic; common very fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Cy—3 to 13 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; common very fine roots; few fine pores; 70 percent soft shale fragments; common fine nests of gypsum; slightly effervescent; moderately alkaline; clear wavy boundary.

Cr—13 to 60 inches; light brownish gray (2.5Y 6/2), semiconsolidated shale that textures to silty clay loam, grayish brown (2.5Y 5/2) moist; very hard, very firm, sticky and plastic; few very fine roots in cracks; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Depth to Cy horizon: 2 to 10 inches

Depth to semiconsolidated shale: 10 to 20 inches

A horizon

Texture: Clay loam or silty clay loam

Clay content: 27 to 35 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 8.4

Cy horizon

Texture: Clay loam or silty clay loam

Clay content: 27 to 35 percent

Content of rock fragments: 50 to 80 percent soft shale fragments

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 5 to 10

Reaction: pH 7.9 to 8.4

Cr horizon

Material: Semiconsolidated shale that textures to clay loam or silty clay loam

Electrical conductivity: 8 to 20 mmhos/cm

Sodium adsorption ratio: 10 to 20

Reaction: pH 7.9 to 8.4

150—Niler silty clay loam, 4 to 35 percent slopes

Composition

Niler and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Hills

Slope: 4 to 35 percent
Elevation: 2,700 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

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

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

Inclusions

- Cambeth soils on back slopes
- Areas of rock outcrop

Management

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

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

Nobe Series

The Nobe series consists of very deep, moderately well drained soils on sedimentary plains, stream terraces, and alluvial fans. These soils formed in alluvium. Slope is 0 to 8 percent. Elevation is 2,500 to 3,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents

Typical Pedon

Nobe silty clay loam, in an area of Absher-Nobe complex, 0 to 4 percent slopes; in an area of rangeland, 1,900 feet west and 1,400 feet north of the southeast corner of sec. 25, T. 8 N., R. 37 E.

E—0 to 1 inch; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; weak very thin platy

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

Bw—1 to 4 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure; very hard, friable, sticky and plastic; common very fine and fine roots; many very fine pores; few thin clay films on faces of peds; few fine soft masses of gypsum; moderately alkaline; clear smooth boundary.

By—4 to 19 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate very fine granular structure; very hard, friable, very sticky and plastic; common very fine and fine roots; many very fine pores; common fine soft masses of gypsum; strongly effervescent; strongly alkaline; gradual smooth boundary.

Byz1—19 to 39 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; very hard, firm, sticky and plastic; few very fine and fine roots; many very fine pores; common fine soft masses of gypsum and other salts; strongly effervescent; strongly alkaline; gradual smooth boundary.

Byz2—39 to 60 inches; light brownish gray (2.5Y 6/2) clay, grayish brown (2.5Y 5/2) moist; massive; extremely hard, very friable, sticky and very plastic; few fine and very fine roots; common very fine pores; common fine soft masses of gypsum and other salts; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

E horizon

Hue: 10YR to 5Y
 Value: 5 to 7 dry; 3 to 5 moist
 Chroma: 2 or 3
 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

Bw horizon

Hue: 10YR to 5Y
 Value: 5 to 7 dry; 4 to 6 moist
 Chroma: 2 or 3
 Texture: Clay, silty clay, or silty clay loam
 Clay content: 27 to 50 percent
 Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 30
Reaction: pH 6.6 to 8.4

By horizon

Hue: 10YR to 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Clay, silty clay, or silty clay loam
Clay content: 35 to 60 percent
Electrical conductivity: 16 to 30 mmhos/cm
Content of gypsum: 1 to 5 percent
Sodium adsorption ratio: 15 to 40
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 7.9 to 9.6

Byz horizon

Hue: 10YR to 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Clay, silty clay, or silty clay loam
Clay content: 35 to 60 percent
Electrical conductivity: 16 to 30 mmhos/cm
Content of gypsum: 1 to 5 percent
Sodium adsorption ratio: 15 to 70
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 7.9 to 9.6

Orinoco Series

The Orinoco series consists of moderately deep, well drained soils on sedimentary plains. These soils formed in residuum derived from semiconsolidated shale. Slope is 2 to 8 percent. Elevation is 3,000 to 3,300 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents

Typical Pedon

Orinoco silty clay loam, in an area of Zatoville-Orinoco silty clay loams, 2 to 8 percent slopes; in an area of rangeland, 1,200 feet west and 1,300 feet north of the southeast corner of sec. 5, T. 11 N., R. 38 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 granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine roots; many very fine pores; strongly effervescent; mildly alkaline; abrupt smooth boundary.

Bw—4 to 7 inches; grayish brown (2.5Y 5/2) silty clay loam, very dark grayish brown (2.5Y 4/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine roots; few very fine tubular pores; strongly

effervescent; mildly alkaline; clear smooth boundary.

Bky—7 to 17 inches; gray (10YR 5/1) silty clay loam, dark gray (10YR 4/1) moist; moderate medium prismatic structure; hard, friable, sticky and plastic; common very fine roots; few very fine irregular pores; few fine soft masses of lime and gypsum; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC—17 to 31 inches; gray (10YR 5/1) silty clay loam, dark gray (10YR 4/1) moist; massive; hard, friable, sticky and plastic; few very fine roots; few very fine irregular pores; common yellow (5Y 8/6) bands of iron sulfide; mildly alkaline; clear smooth boundary.

Cr—31 to 60 inches; gray (10YR 5/1), semiconsolidated shale, dark gray (10YR 4/1) moist; neutral.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to bedrock: 20 to 40 inches

Depth to Bky horizon: 6 to 10 inches

A horizon

Value: 5 or 6 dry; 4 or 5 moist
Clay content: 30 to 40 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 7.4 to 8.4

Bw horizon

Value: 5 or 6 dry; 4 or 5 moist
Texture: Silty clay loam or silty clay
Clay content: 35 to 45 percent
Reaction: pH 7.4 to 8.4

Bky horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: Silty clay loam, clay, or silty clay
Clay content: 35 to 50 percent
Content of rock fragments: 0 to 5 percent pebbles
Electrical conductivity: 4 to 16 mmhos/cm
Sodium adsorption ratio: 5 to 30
Calcium carbonate equivalent: 5 to 15 percent
Content of gypsum: 1 to 5 percent
Reaction: pH 7.9 to 8.4

BC horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 to 5 moist
Chroma: 1 or 2
Texture: Silty clay loam, clay, or silty clay

Clay content: 35 to 50 percent
 Content of rock fragments: 0 to 5 percent pebbles
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 15 to 30
 Reaction: pH 7.4 to 8.4

Cr horizon

Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 15 to 30
 Reaction: pH 6.1 to 7.8

151—Orinoco-Yawdim silty clay loams, 2 to 8 percent slopes

Composition

Orinoco and similar soils: 60 percent
 Yawdim and similar soils: 25 percent
 Inclusions: 15 percent

Setting

Landform:

- Orinoco—Sedimentary plains
- Yawdim—Sedimentary plains

Position on landform:

- Orinoco—Back slopes
- Yawdim—Shoulders and summits

Slope:

- Orinoco—2 to 8 percent
- Yawdim—2 to 8 percent

Elevation: 3,000 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Orinoco

Surface layer texture: Silty clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

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: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Kobar soils on foot slopes
- Vanda soils on foot slopes

Management

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

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

Rahworth Series

The Rahworth series consists of very deep, well drained soils on sedimentary plains. These soils formed in alluvium. Slope is 2 to 8 percent. Elevation is 2,700 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed Borollic Camborthids

Typical Pedon

Rahworth clay loam, in an area of Rahworth-Davidell-Sumatra complex, 2 to 8 percent slopes; in an area of rangeland, 800 feet west and 300 feet south of the northeast corner of sec. 24, T. 9 N., R. 37 E.

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

Bw1—2 to 4 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate very thin platy; hard, friable, sticky and plastic; many very fine roots and pores; moderately alkaline; abrupt smooth boundary.

Bw2—4 to 11 inches; grayish brown (2.5Y 5/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure parting to moderate medium angular blocky; hard, friable, sticky and plastic; common very fine roots; many

very fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—11 to 23 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure; very hard, firm, sticky and plastic; common very fine roots and pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Byz—23 to 36 inches; variegated grayish brown (2.5Y 5/2) and light yellowish brown (2.5Y 6/4) silty clay loam, dark grayish brown (2.5Y 4/2) and light olive brown (2.5Y 5/4) moist; massive; very hard, firm, sticky and plastic; common very fine roots; common fine soft masses and seams of gypsum and few fine soft masses of other salts; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bz—36 to 43 inches; variegated grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/6) silty clay loam, dark grayish brown (2.5Y 4/2) and light olive brown (2.5Y 5/4) moist; massive; very hard, firm, sticky and plastic; few very fine roots; few fine soft masses of salt; moderately alkaline; gradual smooth boundary.

BC—43 to 60 inches; variegated light yellowish brown (2.5Y 6/4) and grayish brown (2.5Y 5/2) silty clay loam; light olive brown (2.5Y 5/4) and dark grayish brown (2.5Y 4/2) moist; massive; very hard, friable, sticky and plastic; few very fine roots; few crystals of primary gypsum; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Bk horizon: 10 to 17 inches

Depth to Byz horizon: 16 to 28 inches

E horizon

Clay content: 20 to 25 percent

Reaction: pH 7.4 to 7.8

Bw1 horizon

Value: 5 or 6 dry

Texture: Loam or clay loam

Clay content: 25 to 30 percent

Reaction: pH 7.4 to 8.4

Bw2 horizon

Texture: Loam or clay loam

Clay content: 25 to 32 percent

Reaction: pH 7.9 to 8.4

Bk horizon

Value: 5 or 6 dry

Texture: Silty clay loam or clay loam

Clay content: 30 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 10 to 25

Reaction: pH 7.9 to 8.4

Byz, Bz, and BC horizons

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 1 to 4

Texture: Silty clay loam or clay loam

Clay content: 30 to 35 percent

Content of gypsum: 0 to 2 percent

Electrical conductivity: 16 to 30 mmhos/cm

Sodium adsorption ratio: 25 to 45

Reaction: pH 7.9 to 8.4

152—Rahworth loam, 2 to 8 percent slopes

Composition

Rahworth and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 5.1 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Davidell soils on foot slopes
- Sumatra soils on shoulders

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

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

Composition

Rahworth and similar soils: 40 percent
Davidell and similar soils: 35 percent
Sumatra and similar soils: 15 percent
Inclusions: 10 percent

Setting

Landform:

- Rahworth—Sedimentary plains
- Davidell—Sedimentary plains
- Sumatra—Sedimentary plains

Position on landform:

- Rahworth—Back slopes
- Davidell—Foot slopes
- Sumatra—Summits

Slope:

- Rahworth—2 to 8 percent
- Davidell—2 to 4 percent
- Sumatra—2 to 8 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Rahworth

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 a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 5.1 inches

Davidell

Surface layer texture: Silt loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 7.0 inches

Sumatra

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 3.7 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Ivanell soils on back slopes
- Niler soils on summits

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Rallod Series

The Rallod series consists of shallow, well drained soils on hills. These soils formed in residuum derived from semiconsolidated shale. Slope is 4 to 15 percent. Elevation is 2,700 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Clayey, montmorillonitic, shallow Borollic Natrargids

Typical Pedon

Rallod clay loam, warm, in an area of Bullock, eroded-Rallod, warm, clay loams, 2 to 15 percent slopes; in an area of rangeland, 600 feet east and 2,300 feet south of the northwest corner of sec. 29, T. 10 N., R. 42 E.

A—0 to 2 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; weak medium angular blocky structure parting to weak

fine angular blocky; soft, very friable, slightly sticky and slightly plastic; many very fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.

Btn—2 to 7 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; strong fine prismatic structure parting to strong medium angular blocky; very hard, firm, sticky and plastic; many very fine roots and pores; many thin clay films on faces of peds and lining pores; slightly effervescent; very strongly alkaline; clear smooth boundary.

Btnk—7 to 12 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium angular blocky structure; very hard, firm, sticky and plastic; many very fine roots and pores; common thin clay films on faces of peds; disseminated lime; strongly effervescent; very strongly alkaline; clear smooth boundary.

Bz—12 to 16 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; massive; hard, friable, sticky and plastic; common very fine roots throughout the horizon; roots matted at the contact with the Cr horizon; few very fine pores; few soft shale fragments in the lower part; few fine soft masses of salts; slightly effervescent; strongly alkaline; clear smooth boundary.

Cr—16 to 60 inches; light gray (10YR 6/1), semiconsolidated shale that crushes to silty clay loam, gray (10YR 5/1) moist; hard, friable, sticky and plastic; mildly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Cr horizon: 10 to 20 inches

Depth to Btnk horizon: 6 to 14 inches

A horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 or 4 moist

Chroma: 2 to 6

Clay content: 18 to 27 percent

Reaction: pH 7.4 to 8.4

Btn and Btnk horizons

Hue: 10YR to 2.5YR

Value: 3 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Silty clay loam, clay loam, or clay

Clay content: 35 to 45 percent

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 13 to 20

Reaction: pH 8.4 to 9.6

Bz horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 1 to 4

Texture: Silty clay loam or clay loam

Clay content: 30 to 40 percent

Content of gypsum: 0 to 2 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 20 to 40

Reaction: pH 8.4 to 9.6

Redcreek Series

The Redcreek series consists of shallow, well drained soils on sedimentary plains. These soils formed in residuum derived from hard sandstone. Slope is 2 to 8 percent. Elevation is 3,100 to 3,800 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F. and the frost-free period is 115 to 130 days.

Taxonomic Class: Loamy, mixed (calcareous), frigid Lithic Ustic Torriorthents

Typical Pedon

Redcreek loam, in an area of Yamac-Redcreek loams, 2 to 15 percent slopes; in an area of rangeland, 2,500 feet west and 2,000 feet north of the southeast corner of sec. 7, T. 6 S., R. 43 E.

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

C1—4 to 7 inches; light olive brown (2.5Y 5/4) loam, olive brown (2.5Y 4/4) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; many very fine roots and pores; 10 percent channers; strongly effervescent; mildly alkaline; clear smooth boundary.

C2—7 to 16 inches; light yellowish brown (2.5Y 6/4) loam, olive brown (2.5Y 4/4) moist; weak very fine and fine subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common very fine roots and pores; 15 percent channers; strongly effervescent; moderately alkaline; abrupt smooth boundary.

R—16 inches; hard sandstone.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to R horizon: 10 to 20 inches

A horizon

Hue: 2.5Y to 5YR

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Clay content: 7 to 18 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

C horizon

Hue: 2.5Y to 5YR

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Clay content: 7 to 18 percent

Content of rock fragments: 0 to 35 percent
channers

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

Ringling Series

The Ringling series consists of very deep, excessively drained soils on hills. These soils formed in material weathered from baked sandstone and shale. Slope is 4 to 70 percent. Elevation is 3,000 to 4,500 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 120 days.

Taxonomic Class: Loamy-skeletal over fragmental, mixed Typic Haploborolls

Typical Pedon

Ringling channery loam, in an area of Lamedeer-Twin Creek, moist-Ringling complex, 4 to 15 percent slopes; in an area of woodland, 2,600 feet west and 700 feet south of the northeast corner of sec. 22, T. 3 S., R. 42 E.

Oi—2 inches to 0; pine needles and twigs.

A—0 to 5 inches; reddish brown (5YR 4/3) channery loam, dark reddish brown (5YR 3/3) moist; weak fine granular structure; soft, friable, nonsticky and nonplastic; common medium, fine, and very fine roots; 30 percent channers; mildly alkaline; clear smooth boundary.

Bw—5 to 17 inches; reddish brown (5YR 4/4) very channery loam, dark reddish brown (2.5YR 3/4) moist; weak very fine subangular blocky structure; soft, friable, nonsticky and nonplastic; common

medium, fine, and very fine roots; 55 percent channers; mildly alkaline; clear smooth boundary.
2Ck—17 to 42 inches; pale red (10YR 6/3), fractured, baked sandstone and shale; few medium, fine, and very fine roots between fragments in the upper part; 5 percent fines; lime casts on coarse fragments in the upper part; gradual wavy boundary.
3C—42 to 60 inches; pale red (10YR 6/3), fractured, baked sandstone; 3 percent fines.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between the depths of 8 and 24 inches

Mollic epipedon thickness: 7 to 14 inches

Depth to fragmental material: 12 to 20 inches

A horizon

Hue: 7.5YR to 10R

Value: 4 or 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 25 percent

Content of rock fragments: 10 to 80 percent—0 to 15 percent flagstones, 10 to 65 percent channers or shale

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 7.5YR to 10R

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 10 to 25 percent

Content of rock fragments: 35 to 80 percent—0 to 25 percent flagstones, 30 to 55 percent channers and shale

Reaction: pH 6.6 to 7.8

2Ck horizon

Clay content: 0 to 5 percent

Content of rock fragments: 95 to 100 percent—90 to 95 percent flagstones, 5 to 10 percent channers and shale

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

3C horizon

Clay content: 0 to 5 percent

Content of rock fragments: 95 to 100 percent—90 to 95 percent flagstones, 5 to 10 percent channers and shale

Reaction: pH 7.4 to 8.4

154—Riverwash**Composition**

Riverwash: 85 percent

Inclusions: 15 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 2,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Definition: Areas of unstable sandy, silty, clayey or gravelly sediments that are frequently flooded, washed, and reworked by water and support little or no vegetation

Flooding: Frequent

Inclusions

- Havre and similar soils
- Glendive and similar soils
- Poorly drained soils

155—Rock outcrop

Composition

Rock outcrop: 85 percent

Inclusions: 15 percent

Setting

Landform: Hills

Slope: 15 to 70 percent

Component Description

Definition: Exposures of bare bedrock

Flooding: None

Inclusions

- Cabbart and similar soils
- Kirby and similar soils
- Yawdim and similar soils
- Areas of abandoned mines

Rominell Series

The Rominell series consists of very deep, well drained soils on alluvial fans and sedimentary plains. These soils formed in alluvium. Slope is 1 to 8 percent. Elevation is 2,500 to 3,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Borollic Natrargids

Typical Pedon

Rominell fine sandy loam, in an area of Bullock, eroded-Rominell complex, 2 to 8 percent slopes; in an area of

rangeland, 1,700 feet west and 1,200 feet north of the southeast corner of sec. 14, T. 9 N., R. 42 E.

Ap—0 to 4 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots and pores; moderately alkaline; abrupt smooth boundary.

E—4 to 8 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; soft, very friable, nonsticky and nonplastic; common very fine roots and pores; moderately alkaline; abrupt smooth boundary.

Btn—8 to 13 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; very dark grayish brown (10YR 3/2 moist) coatings on peds; strong medium columnar structure; very hard, very firm, sticky and plastic; common very fine roots and pores; bleached silt and sand grains on the tops of columns; many thin clay films on faces of peds and in pores; very strongly alkaline; clear smooth boundary.

Bz—13 to 17 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common very fine roots and pores; weakly effervescent; very strongly alkaline; clear smooth boundary.

Byz—17 to 21 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and pores; few fine soft masses of gypsum and other salts; strongly effervescent; moderately alkaline; clear smooth boundary.

C—21 to 60 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine pores; slightly effervescent; very strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Ap horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 or 3

Texture: Fine sandy loam or clay loam

Clay content: 10 to 25 percent
Reaction: pH 6.6 to 8.4

E horizon

Hue: 10YR or 2.5Y
Value: 6 or 7 dry
Chroma: 1 or 2
Texture: Very fine sandy loam, fine sandy loam, silt,
or clay loam
Clay content: 10 to 32 percent
Reaction: pH 7.4 to 8.4

Btn horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay loam, sandy clay loam, or loam
Clay content: 20 to 35 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 60
Reaction: pH more than 8.4

Bz horizon

Hue: 10YR to 5Y
Value: 5 or 6 dry; 3 to 5 moist
Chroma: 2 to 4
Texture: Sandy clay loam, clay loam, or loam
Clay content: 20 to 35 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 13 to 30
Reaction: pH more than 9.0

Byz horizon

Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 to 5 moist
Chroma: 2 or 3
Texture: Clay loam, loam, sandy loam, or sandy
clay loam
Clay content: 10 to 35 percent
Reaction: pH more than 7.9

C horizon

Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Fine sandy loam, loam, clay loam, silty
clay loam, or sandy clay loam
Clay content: 10 to 35 percent
Content of rock fragments: 0 to 10 percent
Sodium adsorption ratio: 13 to 30
Reaction: pH more than 7.9

156—Rominell fine sandy loam, 1 to 4 percent slopes**Composition**

Rominell and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Alluvial fans
Slope: 1 to 4 percent
Elevation: 2,700 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 7.5 inches

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

Inclusions

- Forelle and similar soils
- Areas of slick spots

Management

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

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

Sagedale Series

The Sagedale series consists of very deep, well drained soils on hills. These soils formed in colluvium derived from semiconsolidated shale. Slope is 4 to 35 percent. Elevation is 3,600 to 4,500 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 120 days.

Taxonomic Class: Fine, montmorillonitic, frigid Typic Ustochrepts

Typical Pedon

Sagedale silty clay loam, in an area of Sagedale-Cabba-Wayden complex, 8 to 25 percent slopes; in an area of rangeland, 1,850 feet east and 700 feet south of the northwest corner of sec. 22, T. 5 S., R. 39 E.

- A—0 to 4 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; moderate fine granular structure; slightly hard, friable, sticky and plastic; many very fine roots; slightly effervescent; moderately alkaline; clear smooth boundary.
- Bw—4 to 11 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; moderate medium and coarse prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky and plastic; many very fine roots; many very fine tubular pores; few small masses of lime in the lower part; slightly effervescent; moderately alkaline; clear wavy boundary.
- Bk1—11 to 21 inches; light olive brown (2.5Y 5/4) silty clay loam, olive brown (2.5Y 4/4) moist; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, sticky and plastic; many very fine roots and pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.
- Bk2—21 to 30 inches; variegated light yellowish brown (2.5Y 6/4) and dark gray (N 4/0) silty clay loam, light olive brown (2.5Y 5/4) and very dark gray (N 3/0) moist; massive; extremely hard, firm, sticky and plastic; common very fine roots; few very fine pores; common fine soft masses of lime; slightly effervescent; moderately alkaline; clear wavy boundary.
- Bky—30 to 36 inches; variegated light yellowish brown (2.5Y 6/4) and dark gray (N 4/0) silty clay loam, light olive brown (2.5Y 5/4) and very dark gray (N 3/0) moist; massive; extremely hard, firm, sticky and plastic; few very fine roots and pores; common fine and medium soft masses of lime and gypsum; slightly effervescent matrix; strongly alkaline; clear wavy boundary.
- BC—36 to 60 inches; gray (10YR 5/1) silty clay loam, dark gray (10YR 4/1) moist; massive; extremely hard, firm, sticky and plastic; common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 10 to 18 inches

Depth to gypsum: 17 to 36 inches

Note: Some pedons do not have mottles below a depth of 36 inches.

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 moist

Chroma: 2 to 4

Texture: Silty clay loam or silty clay

Clay content: 30 to 45 percent

Reaction: pH 7.4 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 moist

Chroma: 2 to 4

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

Clay content: 32 to 45 percent

Reaction: pH 7.4 to 8.4

Bk1 horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

Bk2 horizon

Hue: 2.5Y or neutral

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 0 to 4

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: Less than 4 mmhos/cm

Reaction: pH 7.4 to 8.4

Bky horizon

Hue: 10YR to 5Y or neutral

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 0 to 4

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

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 10 percent

Electrical conductivity: Less than 4 mmhos/cm

Content of gypsum: 1 to 7 percent

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 or 2

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Electrical conductivity: Less than 4 mmhos/cm

Reaction: pH 7.4 to 9.0

157—Sagedale silty clay loam, 4 to 15 percent slopes

Composition

Sagedale and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Hills

Slope: 4 to 15 percent

Elevation: 3,600 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Bryant soils on foot slopes
- Savage soils on foot slopes
- Doney soils on back slopes
- Wayden soils on shoulders

Management

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

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

158—Sagedale-Cabba-Wayden complex, 8 to 25 percent slopes

Composition

Sagedale and similar soils: 45 percent

Cabba and similar soils: 20 percent

Wayden and similar soils: 15 percent

Inclusions: 20 percent

Setting

Landform:

- Sagedale—Hills
- Cabba—Hills
- Wayden—Hills

Position on landform:

- Sagedale—Back slopes and foot slopes

- Cabba—Shoulders and summits

- Wayden—Shoulders and summits

Slope:

- Sagedale—8 to 25 percent

- Cabba—8 to 25 percent

- Wayden—8 to 25 percent

Elevation: 3,600 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Sagedale

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.0 inches

Wayden

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Flooding: None

Available water capacity: Mainly 1.8 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Bryant soils on foot slopes
- Savage soils on foot slopes
- Shambo soils on foot slopes
- Areas of rock outcrop

Management

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

- "Range" section

- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Savage Series

The Savage series consists of very deep, well drained soils on sedimentary plains, alluvial fans, and stream terraces. These soils formed in alluvium. Slope is 0 to 8 percent. Elevation is 3,600 to 4,200 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 105 to 120 days.

Taxonomic Class: Fine, montmorillonitic Typic Argiborolls

Typical Pedon

Savage silty clay loam, 0 to 2 percent slopes, in an area of cropland, 2,500 feet north and 600 feet east of the southwest corner of sec. 36, T. 3 S., R. 40 E.

Ap—0 to 6 inches; grayish brown (10YR 5/2) silty clay loam, dark brown (10YR 3/3) moist; clods separate to weak fine granular structure; hard, friable, slightly sticky and plastic; mildly alkaline; abrupt smooth boundary.

Bt—6 to 15 inches; brown (7.5YR 5/2) silty clay, brown (7.5YR 4/2) moist; strong medium prismatic structure parting to moderate medium and fine subangular blocky; very hard, firm, sticky and plastic; many fine and very fine roots and pores; continuous thin clay films on faces of peds and in pores; mildly alkaline; clear wavy boundary.

Bk1—15 to 34 inches; pinkish gray (7.5YR 6/2) silty clay loam, brown (7.5YR 4/2) moist; moderate medium prismatic structure parting to strong medium and fine subangular blocky; hard, friable, sticky and plastic; many fine and very fine pores; few threads and small masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—34 to 42 inches; pinkish gray (7.5YR 7/2) silty clay loam, brown (7.5YR 5/4) moist; massive; hard, friable, sticky and plastic; common very fine roots and pores; common small masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—42 to 60 inches; pinkish gray (7.5YR 7/2) silty clay loam, brown (7.5YR 5/4) moist; massive; hard, friable, sticky and plastic; few very fine roots; common very fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, never dry in all parts for more than 30 consecutive days; frozen November through March

Mollic epipedon thickness: 7 to 16 inches, which can include part or all of the argillic horizon

Depth to Bk horizon: 12 to 30 inches

Ap horizon

Hue: 7.5YR to 2.5Y

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Content of rock fragments: 0 to 5 percent pebbles

Reaction: pH 6.1 to 7.8

Bt horizon

Hue: 7.5YR to 2.5Y

Value: 3 to 5 dry; 2 to 4 moist

Chroma: 2 to 4

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 5 percent pebbles

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 6.1 to 8.4

Bk horizon

Hue: 7.5YR to 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

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

Clay content: 25 to 45 percent

Content of 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

Reaction: pH 7.4 to 8.4

BC horizon

Hue: 7.5 to 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 to 4

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

Clay content: 25 to 45 percent

Content of 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

Reaction: pH 7.4 to 8.4

159—Savage silty clay loam, 0 to 2 percent slopes

Composition

Savage and similar soils: 90 percent
Inclusions: 10 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 3,600 to 4,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

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 9.0 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Shambo and similar soils

Management

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

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

160—Savage silty clay loam, 2 to 8 percent slopes**Composition**

Savage and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans

Slope: 2 to 8 percent

Elevation: 3,600 to 4,200 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

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 9.1 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Bryant and similar soils
- Shambo and similar soils
- Soils that are deep over shale

Management

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

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

Shambo Series

The Shambo series consists of very deep, well drained soils on alluvial fans, sedimentary plains, and hills. These soils formed in alluvium. Slope is 0 to 15 percent. Elevation is 3,300 to 4,500 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 43 degrees F, and the frost-free period is 100 to 115 days.

Taxonomic Class: Fine-loamy, mixed Typic Haploborolls

Typical Pedon

Shambo loam, 2 to 8 percent slopes, in an area of rangeland, 2,100 feet east and 1,760 feet south of the northwest corner of sec. 31, T. 2 S., R. 41 E.

A—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure parting to weak medium prismatic in the lower part; soft, friable, nonsticky and nonplastic; neutral; clear wavy boundary.

Bw1—6 to 9 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; dark grayish brown (10YR 4/2) organic coatings on faces of peds; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, nonsticky and nonplastic; many fine and very fine roots and pores; mildly alkaline; clear wavy boundary.

Bw2—9 to 17 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; very hard, friable, slightly sticky and nonplastic; many fine and very fine roots and pores; moderately alkaline; clear wavy boundary.

Bw3—17 to 26 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate medium and fine subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and pores; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bk—26 to 42 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak medium and fine subangular blocky structure; hard, friable, nonsticky and nonplastic; common fine and very fine roots; many fine and very fine pores; common films and threads of lime; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2C—42 to 60 inches; pale brown (10YR 6/3) fine sandy loam that has strata of loam and silt loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; common fine and very fine roots in the upper part; few fine and very fine roots in the lower part; common fine and very fine pores in the upper part; few fine and very fine pores in the lower part; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to Bk horizon: 10 to 35 inches

Mollic epipedon thickness: 7 to 16 inches

A horizon

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 10 to 27 percent

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 2 to 4

Texture: Loam, silt loam, or clay loam

Clay content: 18 to 35 percent

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 18 to 35 percent

Calcium carbonate equivalent: 10 to 15 percent

Reaction: pH 7.4 to 9.0

2C horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Clay content: 10 to 20 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 9.0

161—Shambo loam, 0 to 2 percent slopes

Composition

Shambo and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 3,400 to 4,000 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

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

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Savage and similar soils
- Macar and similar soils
- Soils that have a darker surface layer

Management

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

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

162—Shambo loam, 2 to 8 percent slopes**Composition**

Shambo and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans
Slope: 2 to 8 percent
Elevation: 3,400 to 4,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 105 to 120 days

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 9.8 inches

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

Inclusions

- Savage and similar soils
- Macar and similar soils
- Shambo fine sandy loam

Management

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

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

163—Shambo loam, 8 to 15 percent slopes**Composition**

Shambo and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Alluvial fans
Slope: 8 to 15 percent
Elevation: 3,400 to 4,200 feet
Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

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 9.6 inches

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

Inclusions

- Bryant and similar soils
- Doney and similar soils
- Twin Creek and similar soils

Management

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

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

164—Shambo-Bitton-Cabba complex, 8 to 15 percent slopes**Composition**

Shambo and similar soils: 40 percent
Bitton and similar soils: 25 percent
Cabba and similar soils: 20 percent
Inclusions: 15 percent

Setting

Landform:

- Shambo—Alluvial fans
- Bitton—Alluvial fans
- Cabba—Hills

Position on landform:

- Cabba—Back slopes and shoulders

Slope:

- Shambo—8 to 15 percent
- Bitton—8 to 15 percent
- Cabba—8 to 15 percent

Elevation: 3,300 to 4,300 feet

Mean annual precipitation: 15 to 19 inches
Frost-free period: 105 to 120 days

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 10.0 inches

Bitton

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Cabba

Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy
 sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.6 inches

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

Inclusions

- Macar and similar soils
- Deep soils that have a surface layer of fine sandy loam
- Moderately deep soils

Management

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

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

165—Shambo-Doney loams, 4 to 15 percent slopes

Composition

Shambo and similar soils: 45 percent
 Doney and similar soils: 40 percent
 Inclusions: 15 percent

Setting

Landform:

- Shambo—Alluvial fans
- Doney—Hills

Position on landform:

- Doney—Back slopes and shoulders

Slope:

- Shambo—4 to 8 percent
- Doney—8 to 15 percent

Elevation: 3,300 to 4,300 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

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

Doney

Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy
 sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.8 inches

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

Inclusions

- Cabba soils on shoulders
- Areas of rock outcrop on summits

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

166—Shambo-Doney-Cabba loams, 8 to 35 percent slopes

Composition

Shambo and similar soils: 40 percent
 Doney and similar soils: 30 percent
 Cabba and similar soils: 15 percent
 Inclusions: 15 percent

Setting

Landform:

- Shambo—Alluvial fans
- Doney—Hills
- Cabba—Hills

Position on landform:

- Doney—Back slopes
- Cabba—Back slopes and shoulders

Slope:

- Shambo—8 to 15 percent
- Doney—15 to 35 percent
- Cabba—15 to 35 percent

Elevation: 3,300 to 4,300 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

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

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.7 inches

Cabba

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.6 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Castner soils on summits
- Sagedale soils on foot slopes

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

167—Shambo-Doney-Sagedale complex, 8 to 35 percent slopes

Composition

Shambo and similar soils: 30 percent
 Doney and similar soils: 30 percent
 Sagedale and similar soils: 30 percent
 Inclusions: 10 percent

Setting

Landform:

- Shambo—Alluvial fans
- Doney—Hills
- Sagedale—Hills

Position on landform:

- Doney—Back slopes
- Sagedale—Back slopes and foot slopes

Slope:

- Shambo—8 to 15 percent
- Doney—15 to 35 percent
- Sagedale—15 to 35 percent

Elevation: 3,600 to 4,500 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

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 11.0 inches

Doney

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.4 inches

Sagedale

Surface layer texture: Silty clay loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 9.4 inches

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

Inclusions

- Cabba soils on shoulders
- Castner soils on summits
- Areas of rock outcrop on summits

Management

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

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

Spang Series

The Spang series consists of very deep, well drained soils on alluvial fans and sedimentary plains. These soils formed in alluvium or colluvium derived from baked sandstone. Slope is 2 to 15 percent. Elevation is 3,100 to 4,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is

about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Coarse-loamy, mixed Borollic Camborthids

Typical Pedon

Spang sandy loam, moist, in an area of Spang, moist-Birney, moist-Birney complex, 8 to 25 percent slopes; in an area of woodland, 1,875 feet east and 2,025 feet north of the southwest corner of sec. 30, T. 6 S., R. 42 E.

A—0 to 6 inches; reddish brown (5YR 5/4) sandy loam, dark reddish brown (5YR 3/4) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; neutral; abrupt smooth boundary.

Bw1—6 to 17 inches; reddish brown (5YR 5/4) sandy loam, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine tubular pores; neutral; clear smooth boundary.

Bw2—17 to 37 inches; red (2.5YR 5/6) sandy loam, red (2.5YR 4/6) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; common very fine roots; many very fine tubular pores; neutral; clear smooth boundary.

C—37 to 60 inches; reddish brown (2.5YR 5/4) sandy loam, reddish brown (2.5YR 4/4) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; neutral.

Range in Characteristics

Soil temperature: 43 to 46 degrees F

Moisture control section: Between the depths of 8 and 24 inches

A horizon

Hue: 5YR or 7.5YR

Value: 3 or 4 moist

Chroma: 3 or 4

Clay content: 10 to 20 percent

Content of rock fragments: 0 to 5 percent angular pebbles of baked sandstone

Reaction: pH 6.1 to 7.3

Bw1 horizon

Hue: 5YR or 7.5YR

Chroma: 3 or 4

Texture: Sandy loam or fine sandy loam

Clay content: 10 to 20 percent

Content of rock fragments: 0 to 5 percent angular pebbles of baked sandstone

Reaction: pH 6.6 to 7.3

Bw2 horizon

Hue: 2.5YR to 7.5YR
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 3 to 6
 Texture: Sandy loam or fine sandy loam
 Clay content: 8 to 18 percent
 Content of rock fragments: 0 to 15 percent angular pebbles of baked sandstone
 Reaction: pH 6.6 to 8.4

C horizon

Hue: 2.5YR to 7.5YR
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 3 to 6
 Texture: Sandy loam, fine sandy loam, or loamy sand
 Clay content: 5 to 15 percent
 Content of rock fragments: 0 to 15 percent angular pebbles of baked sandstone
 Reaction: pH 6.6 to 8.4

168—Spang sandy loam, 2 to 8 percent slopes**Composition**

Spang and similar soils: 90 percent
 Inclusions: 10 percent

Setting

Landform: Sedimentary plains and alluvial fans
Slope: 2 to 8 percent
Elevation: 3,100 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.9 inches

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

Inclusions

- Birney soils on shoulders

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

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

169—Spang-Birney complex, 8 to 15 percent slopes**Composition**

Spang and similar soils: 40 percent
 Birney and similar soils: 35 percent
 Inclusions: 25 percent

Setting**Landform:**

- Spang—Alluvial fans
- Birney—Hills

Slope:

- Spang—8 to 15 percent
- Birney—8 to 15 percent

Elevation: 3,100 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description**Spang**

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.4 inches

Birney

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

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

Inclusions

- Coopers soils on foot slopes
- Kirby soils on summits

- Areas of soils that have a stony surface

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

170—Spang, moist-Birney, moist-Birney complex, 8 to 25 percent slopes

Composition

Spang and similar soils: 50 percent
 Birney, moist, and similar soils: 20 percent
 Birney and similar soils: 15 percent
 Inclusions: 15 percent

Setting

Landform:

- Spang—Hills
- Birney, moist—Hills
- Birney—Hills

Position on landform:

- Spang—Back slopes
- Birney, moist—Back slopes
- Birney—Back slopes

Slope:

- Spang—8 to 15 percent
- Birney, moist—15 to 25 percent, north aspect
- Birney—15 to 25 percent, south aspect

Elevation: 3,100 to 4,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Spang

Surface layer texture: Sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium or colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 8.4 inches

Birney, moist

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Forest land

Flooding: None

Available water capacity: Mainly 4.4 inches

Birney

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.3 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Kirby soils on summits
- Coopers soils on foot slopes
- Areas of rock outcrop
- Areas of soils that have boulders

Management

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

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

Spinekop Series

The Spinekop series consists of very deep, well drained soils on stream terraces. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 2,400 to 2,600 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Borollic Camborthids

Typical Pedon

Spinekop silty clay loam, 0 to 2 percent slopes, in an area of cropland, 1,900 feet west and 2,200 feet north of the southeast corner of sec. 21, T. 6 N., R. 39 E.

Ap—0 to 11 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate subangular blocky structure parting to weak fine and medium granular; hard, friable, sticky and plastic; common fine roots; mildly

alkaline; abrupt smooth boundary.

Bw—11 to 17 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate medium angular blocky; hard, friable, sticky and plastic; common fine roots; many very fine pores; mildly alkaline; clear smooth boundary.

2Bk—17 to 21 inches; light yellowish brown (2.5Y 6/4) loam, light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; many very fine pores; strongly effervescent; mildly alkaline; clear smooth boundary.

2BC—21 to 33 inches; pale brown (10YR 6/3) clay loam, light olive brown (2.5Y 5/4) moist; massive; hard, friable, sticky and plastic; few fine roots; many very fine pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2C1—33 to 43 inches; pale brown (10YR 6/3) loam that has strata of fine sandy loam and silty clay loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline; abrupt smooth boundary.

2C2—43 to 60 inches; pale brown (10YR 6/3) loam that has strata of fine sandy loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 44 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to stratified material: 32 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 40 percent

Reaction: pH 7.4 to 7.8

Bw horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Clay content: 27 to 35 percent

Reaction: pH 7.4 to 7.8

2Bk and 2BC horizons

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or silty clay loam

Calcium carbonate equivalent: 5 to 15 percent

Clay content: 18 to 35 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 8.4

2C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Loam or clay loam that has thin layers of fine sandy loam or silty clay loam, or both

Clay content: 18 to 30 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 8.4

171—Spinekop silty clay loam, 0 to 2 percent slopes

Composition

Spinekop and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 2,400 to 2,600 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Kobar and similar soils
- Yamac and similar soils
- Spinekop silty clay
- Soils that are calcareous throughout

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Straw Series

The Straw series consists of very deep, well drained soils on stream terraces. These soils formed in alluvium. Slope is 0 to 2 percent. Elevation is 3,200 to 3,800 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 43 degrees F, and the frost-free period is 105 to 120 days.

Taxonomic Class: Fine-loamy, mixed Cumulic Haploborolls

Typical Pedon

Straw loam, in an area of Straw-Canburn, warm, loams, 0 to 2 percent slopes; in an area of rangeland, 1,340 feet south and 1,280 feet east of the northwest corner of sec. 24, T. 5 S., R. 38 E.

- A1—0 to 9 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak thin platy structure in the upper 3 inches and very weak medium prismatic structure in the lower part; slightly hard, very friable, nonsticky and nonplastic; many fine and very fine roots; mildly alkaline; clear smooth boundary.
- A2—9 to 19 inches; grayish brown (10YR 5/2) loam stratified with very fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure; slightly hard, very friable, sticky and nonplastic; many fine and very fine roots and pores; mildly alkaline; clear wavy boundary.
- Bw—19 to 31 inches; grayish brown (10YR 5/2) loam, very dark brown (10YR 2/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many fine and very fine roots and pores; slightly effervescent; moderately alkaline; gradual smooth boundary.
- C1—31 to 44 inches; grayish brown (10YR 5/2) loam stratified with clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots and pores; slightly effervescent; moderately alkaline; clear smooth boundary.
- C2—44 to 52 inches; pale brown (10YR 6/3) silt loam stratified with loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; few fine and very fine pores; slightly effervescent; moderately alkaline; abrupt smooth boundary.

C3—52 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; few fine distinct very dark gray (10YR 3/1) moist, mottles; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine threads of lime; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, not dry in all parts for 60 or more consecutive days after July 1

Mollic epipedon thickness: 16 to 40 inches

A horizon

Hue: 10YR or 2.5Y

Value: 3 to 5 dry; 2 or 3 moist

Chroma: 2 or 3

Note: 15 to 40 percent of the sand is fine or coarser.

Clay content: 10 to 27 percent

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 0 to 5 percent

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 2 to 5 moist

Chroma: 2 to 4

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

Note: 15 to 40 percent of the sand is fine or coarser.

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 10 percent pebbles

Reaction: pH 6.6 to 8.4

C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 10 percent pebbles

Calcium carbonate equivalent: 3 to 15 percent

Reaction: pH 7.4 to 8.4

172—Straw-Canburn, warm, loams, 0 to 2 percent slopes

Composition

Straw and similar soils: 60 percent

Canburn and similar soils: 30 percent

Inclusions: 10 percent

Setting

Landform:

- Straw—Stream terraces
- Canburn—Flood plains

Slope:

- Straw—0 to 2 percent
- Canburn—0 to 2 percent

Elevation: 3,200 to 3,800 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 105 to 120 days

Component Description

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 10.3 inches

Canburn

Surface layer texture: Loam

Depth class: Very deep (more than 60 inches)

Drainage class: Very poorly drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: Frequent

Water table: Apparent

Available water capacity: Mainly 10.4 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Soils in meandering channels
- Straw clay loam
- Very poorly drained soils

Management

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

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

Sumatra Series

The Sumatra series consists of very deep, well drained soils on sedimentary plains and hills. These

soils formed in alluvium. Slope is 2 to 35 percent. Elevation is 2,700 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed, nonacid, frigid Ustic Torriorthents

Typical Pedon

Sumatra silty clay loam, 4 to 25 percent slopes, in an area of rangeland, 1,600 feet south and 2,000 feet east of the northwest corner of sec. 29, T. 9 N., R. 39 E.

A—0 to 2 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate fine granular structure; soft, firm, sticky and plastic; common fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

By—2 to 9 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive with some vertical cleavage; very hard, firm, sticky and plastic; few fine roots and pores; common fine soft masses of gypsum; strongly effervescent; moderately alkaline; clear smooth boundary.

BC—9 to 29 inches; light brownish gray (2.5Y 6/2) silty clay loam, light grayish brown (2.5Y 5/2) moist; massive; very hard, firm, sticky and plastic; few fine roots and pores; moderately alkaline; gradual smooth boundary.

C—29 to 60 inches; variegated light gray (2.5Y 7/2) and pale yellow (2.5Y 7/4) silty clay loam, light grayish brown (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) moist; massive; very hard, firm, sticky and plastic; few fine roots and pores; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

A horizon

Hue: 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Clay content: 27 to 35 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.9 to 8.4

By horizon

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4

Texture: Silty clay loam or clay loam

Clay content: 27 to 35 percent

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 10 to 25

Reaction: pH 7.9 to 8.4

BC and C horizons

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 to 4

Texture: Silty clay loam or clay loam

Clay content: 27 to 35 percent

Electrical conductivity: 16 to 30 mmhos/cm

Sodium adsorption ratio: 25 to 45

Reaction: pH 7.9 to 8.4

173—Sumatra silty clay loam, 4 to 25 percent slopes**Composition**

Sumatra and similar soils: 85 percent

Inclusions: 15 percent

Setting*Landform:* Hills*Slope:* 4 to 25 percent*Elevation:* 2,700 to 3,000 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 115 to 130 days**Component Description***Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within a depth of 30 inches*Sodium affected:* Sodic within a depth of 30 inches*Available water capacity:* Mainly 3.5 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Davidell soils on foot slopes
- Ivanell soils on back slopes
- Niler soils on back slopes
- Rahworth soils on back slopes
- Areas of rock outcrop

Management

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

- "Range" section
- "Agronomy" section

- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

174—Sumatra-Rock outcrop complex, 4 to 35 percent slopes**Composition**

Sumatra and similar soils: 55 percent

Rock outcrop: 30 percent

Inclusions: 15 percent

Setting*Landform:*

- Sumatra—Hills
- Rock outcrop—Hills

Position on landform:

- Sumatra—Back slopes
- Rock outcrop—Shoulders and summits

Slope:

- Sumatra—4 to 35 percent
- Rock outcrop—4 to 35 percent

Elevation: 2,700 to 3,000 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 115 to 130 days**Component Description****Sumatra***Surface layer texture:* Silty clay loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Alluvium*Native plant cover type:* Rangeland*Flooding:* None*Salt affected:* Saline within a depth of 30 inches*Sodium affected:* Sodic within a depth of 30 inches*Available water capacity:* Mainly 3.5 inches**Rock outcrop***Definition:* Exposures of siltstone bedrock*Flooding:* None

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Niler soils on back slopes
- Rahworth soils on back slopes

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Tinsley Series

The Tinsley series consists of very deep, excessively drained soils on relict stream terraces. These soils formed in alluvium. Slope is 8 to 45 percent. Elevation is 2,500 to 3,300 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Sandy-skeletal, mixed, frigid Typic Ustorthents

Typical Pedon

Tinsley very gravelly sandy loam, in an area of Tinsley-Armells-Yamac complex, 8 to 35 percent slopes; in an area of rangeland, 2,100 feet east and 300 feet north of the southwest corner of sec. 21, T. 6 N., R. 40 E.

A—0 to 4 inches; brown (10YR 5/3) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; 40 percent pebbles; neutral; clear smooth boundary.

C1—4 to 13 inches; brown (10YR 5/3) extremely gravelly loamy sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; many very fine roots; 60 percent pebbles and 5 percent cobbles; neutral; clear smooth boundary.

C2—13 to 60 inches; pale brown (10YR 6/3) very gravelly sand, brown (10YR 4/3) moist; single grain; loose, nonsticky and nonplastic; few very fine roots; 50 percent pebbles and 5 percent cobbles; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 12 and 35 inches, frozen November through March

A horizon

Hue: 10YR or 2.5Y

Value: 4 or 5 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 5 to 10 percent

Content of 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 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Sand or loamy sand

Clay content: 0 to 10 percent

Content of rock fragments: 35 to 70 percent—5 to 15 percent stones and cobbles, 30 to 60 percent pebbles

Reaction: pH 6.6 to 8.4

175—Tinsley very gravelly sandy loam, 15 to 35 percent slopes

Composition

Tinsley and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Relict stream terraces

Slope: 15 to 35 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Very gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Busby soils on foot slopes
- Yamac soils on foot slopes
- Cabbart soils on back slopes
- Delpoint soils on back slopes

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section

- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

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

Composition

Tinsley and similar soils: 40 percent
 Armells and similar soils: 30 percent
 Yamac and similar soils: 20 percent
 Inclusions: 10 percent

Setting

Landform:

- Tinsley—Relict stream terraces
- Armells—Relict stream terraces
- Yamac—Alluvial fans

Slope:

- Tinsley—8 to 35 percent
- Armells—25 to 35 percent
- Yamac—8 to 15 percent

Elevation: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Tinsley

Surface layer texture: Very gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.2 inches

Armells

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 4.5 inches

Yamac

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

A typical soil description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as

horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Blackhall soils on back slopes
- Cabbart soils on back slopes
- Twilight soils on back slopes
- Busby soils on foot slopes

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

177—Tinsley-Cabbart complex, 15 to 45 percent slopes

Composition

Tinsley and similar soils: 35 percent
 Cabbart and similar soils: 35 percent
 Inclusions: 30 percent

Setting

Landform:

- Tinsley—Relict stream terraces
- Cabbart—Hills

Position on landform:

- Tinsley—Shoulders and summits
- Cabbart—Foot slopes

Slope:

- Tinsley—15 to 45 percent
- Cabbart—15 to 45 percent

Elevation: 2,500 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Tinsley

Surface layer texture: Very gravelly sandy loam

Depth class: Very deep (more than 60 inches)

Drainage class: Excessively drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Blackhall soils on back slopes
- Delpoint soils on back slopes
- Yawdim soils on back slopes
- Busby soils on foot slopes
- Yamac soils on foot slopes
- Areas of rock outcrop

Management

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

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

Twilight Series

The Twilight series consists of moderately deep, well drained soils on sedimentary plains and hills. These soils formed in semiconsolidated, sandy sedimentary beds. Slope is 2 to 25 percent. Elevation is 2,700 to 3,900 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Coarse-loamy, mixed Borollic Camborthids

Typical Pedon

Twilight fine sandy loam, in an area of Twilight-Blackhall, warm, fine sandy loams, 15 to 70 percent slopes; in an area of grassland, 100 feet west and 1,500 feet north of the southeast corner of sec. 8, T. 7 N., R. 38 E.

A—0 to 5 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine roots; few hard

angular sandstone pebbles; mildly alkaline; clear smooth boundary.

Bw1—5 to 11 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine roots; few hard angular sandstone pebbles; slightly effervescent; mildly alkaline; gradual smooth boundary.

Bw2—11 to 24 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine roots; few hard angular sandstone pebbles; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—24 to 33 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine roots; few hard angular sandstone pebbles; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—33 to 60 inches; light gray (2.5Y 7/2), semiconsolidated, sandy sedimentary beds that texture to fine sandy loam, light olive brown (2.5Y 5/4) moist; hard, friable, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 12 and 35 inches, frozen November through March

Depth to 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 to 4

Texture: Fine sandy loam or sandy loam

Clay content: 5 to 18 percent

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 1 to 4

Clay content: 5 to 18 percent

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.4 to 8.4

178—Twilight-Blackhall, warm, fine sandy loams, 15 to 70 percent slopes

Composition

Twilight and similar soils: 40 percent
 Blackhall and similar soils: 30 percent
 Inclusions: 30 percent

Setting

Landform:

- Twilight—Hills
- Blackhall—Hills

Position on landform:

- Twilight—Back slopes
- Blackhall—Back slopes and shoulders

Slope:

- Twilight—15 to 25 percent
- Blackhall—15 to 70 percent

Elevation: 2,700 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Twilight

Surface layer texture: Fine sandy loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.6 inches

Blackhall

Surface layer texture: Fine sandy loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, sandy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

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

Inclusions

- Busby soils on foot slopes
- Galbreth soils on summits
- Yetull soils on summits
- Areas of rock outcrop

Management

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

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

Twin Creek Series

The Twin Creek series consists of very deep, well drained soils on alluvial fans, stream terraces, sedimentary plains, and hills. These soils formed in alluvium derived from baked sandstone and shale. Slope is 2 to 25 percent. Elevation is 3,300 to 4,500 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 115 days.

Taxonomic Class: Fine-loamy, mixed Typic Haploborolls

Typical Pedon

Twin Creek loam, in an area of Twin Creek-Shambo loams, 2 to 8 percent slopes; in an area of rangeland, 1,000 feet west and 2,100 feet south of the northeast corner of sec. 4, T. 4 S., R. 42 E.

A—0 to 7 inches; reddish brown (5YR 4/3) loam, dark reddish brown (5YR 3/2) moist; weak fine granular structure; soft, friable, nonsticky and slightly plastic; many fine and very fine roots; 5 percent channers; mildly alkaline; clear wavy boundary.

Bw—7 to 14 inches; reddish brown (5YR 5/3) loam, reddish brown (5YR 4/3) moist; weak medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and pores; 5 percent channers; mildly alkaline; gradual wavy boundary.

Bk1—14 to 24 inches; reddish brown (5YR 5/3) loam, reddish brown (5YR 4/3) moist; weak medium prismatic structure parting to weak medium and fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots and pores; 5 percent channers; few fine masses of lime; strongly effervescent; moderately alkaline; clear wavy boundary.

Bk2—24 to 44 inches; light reddish brown (5YR 6/4) loam, reddish brown (5YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly

plastic; common fine and very fine roots; many fine and very fine pores; 10 percent channers; few fine masses of lime; strongly effervescent; moderately alkaline; gradual wavy boundary.

BC—44 to 60 inches; light reddish brown (5YR 6/4) loam, yellowish red (5YR 4/6) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine and very fine roots; 10 percent channers; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Mollic epipedon thickness: 7 to 14 inches

A horizon

Hue: 7.5YR to 10R

Value: 3 or 4 dry; 2 or 3 moist

Chroma: 2 or 3

Clay content: 20 to 27 percent

Content of rock fragments: 0 to 10 percent pebbles or channers

Reaction: pH 6.6 to 7.8

Bw horizon

Hue: 7.5YR to 10R

Value: 4 or 5 dry; 2 to 4 moist

Chroma: 2 or 3

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

Clay content: 20 to 32 percent

Content of rock fragments: 0 to 10 percent pebbles or channers

Reaction: pH 6.6 to 7.8

Bk horizon

Hue: 7.5YR to 10R

Value: 4 to 6 dry; 2 to 5 moist

Chroma: 2 to 4

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Content of rock fragments: 0 to 10 percent pebbles or channers

Calcium carbonate equivalent: 25 to 35 percent

Reaction: pH 7.9 to 8.4

BC horizon

Hue: 7.5YR to 10R

Value: 4 to 6 dry; 3 to 5 moist

Chroma: 3 to 6

Texture: Loam or clay loam

Clay content: 20 to 32 percent

Content of rock fragments: 0 to 10 percent pebbles or channers

Reaction: pH 8.4 to 9.0

179—Twin Creek-Shambo loams, 2 to 8 percent slopes

Composition

Twin Creek and similar soils: 50 percent

Shambo and similar soils: 30 percent

Inclusions: 20 percent

Setting

Landform:

- Twin Creek—Sedimentary plains and alluvial fans
- Shambo—Sedimentary plains and alluvial fans

Slope:

- Twin Creek—2 to 8 percent
- Shambo—2 to 8 percent

Elevation: 3,400 to 4,400 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Twin Creek

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

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

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

Inclusions

- Cabba soils on shoulders
- Doney soils on shoulders
- Bitton soils on summits
- Kirby soils on summits

Management

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

- "Range" section

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

Typic Fluvaquents

Typic Fluvaquents consist of very deep, poorly drained soils that formed in alluvium on the flood plains of narrow drainageways. Slope is 0 to 2 percent. Elevation is 3,500 to 4,200 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 115 days.

Typical Pedon

Typic Fluvaquents in an area of Fluventic Haploborolls-Typic Fluvaquents complex, 0 to 4 percent slopes; in an area of rangeland, 1,920 feet west and 640 feet south of the center of sec. 8, T. 4 S., R. 40 E.

- A—0 to 3 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) dry; moderate medium and fine granular structure; slightly hard, friable, sticky and plastic; many fine and medium roots; strongly effervescent; mildly alkaline; abrupt smooth boundary.
- C1—3 to 18 inches; light brownish gray (2.5Y 6/2) loam stratified with thin strata of fine sandy loam, dark grayish brown (2.5Y 4/2) moist; common fine very dark gray (5Y 3/1) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots; common medium and fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.
- C2—18 to 46 inches; grayish brown (2.5Y 5/2) silty clay loam stratified with thin strata of silt loam and silty clay, dark grayish brown (2.5Y 4/2) moist; massive; few medium roots; common fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- C3—46 to 60 inches; brown (10YR 5/3), stratified silt loam and loam with thin strata of fine sandy loam and silty clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to seasonal high water table: 0 to 20 inches from April through July

A horizon

Texture: Loam or silty clay loam

C horizon

Texture: Silt loam, loam, clay loam, or silty clay loam that has strata of sandy loam to silty clay

Typic Haplaquepts

Typic Haplaquepts consist of very deep, poorly drained and very poorly drained soils that formed in alluvium. These soils are on slightly concave slopes in depressional areas. Slope is 0 to 2 percent. Elevation is 3,800 to 4,300 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is 100 to 115 days.

Typical Pedon

Typic Haplaquepts, 0 to 2 percent slopes, in an area of rangeland, 1,280 feet west and 640 feet south of the northeast corner of sec. 3, T. 4 S., R. 42 E.

- A—0 to 3 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; weak fine subangular blocky structure; hard, firm, very sticky and very plastic; common fine roots; slightly effervescent; mildly alkaline; clear smooth boundary.
- Bw—3 to 20 inches; gray (5Y 6/1) clay, dark gray (5Y 4/1) moist; massive with some vertical cracks; extremely hard, very firm, very sticky and plastic; few fine roots; strongly effervescent; strongly alkaline; gradual wavy boundary.
- BC—20 to 44 inches; gray (5Y 6/1) clay, gray (5Y 5/1) moist; massive; extremely hard, very firm, very sticky and plastic; few fine roots; few fine lime nodules; strongly effervescent; strongly alkaline; gradual wavy boundary.
- C—44 to 60 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 4/2) dry; few brown mottles; massive; extremely hard, very firm, very sticky and plastic; few fine salt and lime nodules; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to seasonal high water table: 12 to 24 inches from April through July
Texture: Silty clay loam, clay, or silty clay
Clay content: 30 to 70 percent

180—Typic Haplaquepts, 0 to 2 percent slopes

Composition

Typic Haplaquepts and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Closed depressions

Slope: 0 to 2 percent

Elevation: 3,800 to 4,300 feet

Mean annual precipitation: 15 to 19 inches

Frost-free period: 100 to 115 days

Component Description

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Flooding: Frequent

Water table: Apparent

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Somewhat poorly drained soils
- Ponded soils

Management

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

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

Ustic Torrfluents

Ustic Torrfluents consist of very deep, moderately well drained to somewhat excessively drained soils that formed in alluvium. These soils are on flood plains. Slope is 0 to 2 percent. Elevation is 2,400 to 3,400 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the average frost-free period is 115 to 130 days.

Typical Pedon

Ustic Torrfluents in an area of Borollic Camborthids-Ustic Torrfluents complex, 0 to 8 percent slopes; in an area of rangeland, in the southeast corner of sec. 33, T. 12 N., R. 35 E.

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

C1—3 to 10 inches; grayish brown (10YR 5/2) loam,

dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; very hard, friable, sticky and plastic; many very fine roots and pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—10 to 26 inches; light brownish gray (10YR 6/2) silty loam, dark grayish brown (10YR 4/2) moist, weak coarse prismatic structure; slightly hard, friable, sticky and plastic; common very fine roots and pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

C3—26 to 36 inches; light brownish gray (10YR 6/2) fine sandy loam stratified with thin strata of loam, sandy loam, and loamy fine sand, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common fine roots grading to few in the lower part; common fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C4—36 to 60 inches; light brownish gray (2.5Y 6/2) loam stratified with thin strata of fine sandy loam and silt loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; few fine and very fine roots; common medium and fine pores; strongly effervescent; moderately alkaline.

Range in Characteristics

Depth to seasonal high water table: 36 to 60 inches

Texture: Sandy loam to silty clay

Electrical conductivity: 8 to 16 mmhos/cm in the saline phase

181—Ustic Torrfluents, 0 to 2 percent slopes, frequently flooded**Composition**

Ustic Torrfluents and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Flooding: Frequent

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

Additional information specific to this map unit, such as

horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Slightly saline soils
- Moderately saline soils
- Poorly drained soils

Management

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

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

182—Ustic Torrifluvents, saline, 0 to 2 percent slopes, frequently flooded

Composition

Ustic Torrifluvents and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Elevation: 2,400 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Depth class: Very deep (more than 60 inches)

Dominant parent material: Alluvium

Flooding: Frequent

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

Inclusions

- Areas of soils that are not subject to flooding
- Somewhat poorly drained soils

Management

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

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

Ustic Torriorthents

Ustic Torriorthents consists of moderately deep to very deep, well drained and somewhat excessively drained soils that formed in alluvium or residuum. These soils are on hills. Slope is 15 to 35 percent. Elevation is 2,500 to 3,900 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the average frost-free period is 115 to 130 days.

Typical Pedon

Ustic Torriorthents, 15 to 35 percent slopes, in an area of rangeland, 2,400 feet north and 500 feet west of the southeast corner of sec. 12, T. 2 N., R. 4 E.

- A—0 to 3 inches; grayish brown (10YR 5/2) loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, very friable, sticky and plastic; slightly effervescent; moderately alkaline; clear smooth boundary.
- C1—3 to 17 inches; light brownish gray (2.5Y 6/2) loam, grayish brown (2.5Y 5/2) moist; weak medium blocky structure; hard, very friable, sticky and plastic; many fine and very fine roots and pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- C2—17 to 28 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/3) moist; massive; hard, very friable, sticky and plastic; common fine roots; many fine and very fine pores; strongly effervescent; strongly alkaline; gradual wavy boundary.
- C3—28 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; strongly effervescent; strongly alkaline.

Range in Characteristics

Depth to Cr horizon: 20 to 60 inches or more

A horizon

Texture: Very fine sandy loam to silt loam

Content of rock fragments: 0 to 15 percent pebbles

C horizon

Texture: Very fine sandy loam to silty clay loam

Content of rock fragments: 0 to 35 percent pebbles

183—Ustic Torriorthents, 15 to 35 percent slopes

Composition

Ustic Torriorthents and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Hills

Slope: 15 to 35 percent

Elevation: 2,500 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Dominant parent material: Alluvium or residuum

Flooding: None

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Areas of rock outcrop
- Cabbart and similar soils
- Yawdim and similar soils
- Deep soils in drainageways

Management

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

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

Ustic Torriorthents, Clayey

Ustic Torriorthents, clayey, consist of alluvium or residuum. These soils are on sedimentary plains. Slope is 2 to 8 percent. Elevation is 2,800 to 3,000 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the average frost-free period is 115 to 130 days.

Typical Pedon

Ustic Torriorthents, clayey, in an area of Ustic Torriorthents, clayey-Volborg, saline, complex, 1 to 8 percent slopes; in an area of rangeland, 700 feet south and 700 feet west of the northeast corner of sec. 24, T. 10 N., R. 38 E.

0 to 60 inches; light gray (10YR 6/1) unconsolidated shale fragments, dark gray (10YR 4/1) moist; extremely acid.

Range in Characteristics

Reaction: pH less than 6.6

Electrical conductivity: 4 to 16 mmhos/cm

Size of shale fragments: 2 to 20 millimeters

Ustic Torriorthents, Loamy

Ustic Torriorthents, loamy, consist of very deep, well drained soils that formed in alluvial material removed from strip mines. These soils are on hills. Slope is 4 to 15 percent. Elevation is 3,200 to 3,500 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Typical Pedon

Ustic Torriorthents, loamy, 4 to 15 percent slopes, in a pastured area, in the northeast corner of sec. 34, T. 2 N., R. 41 E.

A—0 to 4 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; weak medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; many very fine and fine pores; 1 percent pebbles; slightly effervescent, moderately alkaline; clear smooth boundary.

C1—4 to 20 inches; light gray (2.5Y 7/2) fine sandy loam, light olive brown (2.5Y 5/4) moist; soft, very friable, nonsticky and nonplastic; common very fine roots; few very fine pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C2—20 to 32 inches; very pale brown (10YR 7/3) fine sandy loam, light brown (2.5Y 5/4) moist; soft, very friable, nonsticky and nonplastic; strongly effervescent; strongly alkaline; clear smooth boundary.

C3—32 to 40 inches; light gray (5Y 7/2) silty clay loam, olive gray (5Y 5/2) moist; hard, friable, sticky and plastic; strongly effervescent; strongly alkaline; clear smooth boundary.

C4—40 to 60 inches; pale yellow (2.5Y 7/4) fine sandy loam, light olive brown (2.5Y 5/4) moist; soft, very friable, nonsticky and nonplastic; strongly effervescent; strongly alkaline.

Range in Characteristics

A horizon

Texture: Loamy fine sand to loam

Content of rock fragments: 0 to 10 percent pebbles

C horizon

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

Content of rock fragments: 0 to 10 percent pebbles

184—Ustic Torriorthents, loamy, 4 to 15 percent slopes

Composition

Ustic Torriorthents and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Hills

Slope: 4 to 15 percent

Elevation: 3,200 to 3,500 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Flooding: None

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

Inclusions

- Areas of soils that have slopes of more than 15 percent
- Areas of active coal mines

Management

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

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

Ustic Torriorthents, Moderately Saline

Ustic Torriorthents, moderately saline, consist of very deep, well drained, sodium- and salt-affected soils. These soils formed in alluvium on hills. Slope is 0 to 70 percent. Elevation is 2,600 to 3,200 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the average frost-free period is 115 to 120 days.

Typical Pedon

Ustic Torriorthents, moderately saline, 0 to 70 percent slopes, in an area of rangeland, 1,000 feet west of the center of sec. 7, T. 12 N., R. 33 E.

A—0 to 2 inches; grayish brown (2.5Y 5/2) clay loam that has a thin vesicular crust, very dark grayish brown (2.5Y 3/2) moist; weak fine granular structure; very hard, friable, sticky and plastic, slightly effervescent; strongly alkaline; clear smooth boundary.

C1—2 to 10 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, friable, sticky and plastic; common fine and very fine pores; slightly effervescent; strongly alkaline; gradual wavy boundary.

C2—10 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; extremely hard, friable, sticky and slightly plastic; few fine roots and pores; thin lenses of fine sandy loam; few threads of lime and few threads of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

Texture: Loam to clay

Clay content: 20 to 45 percent

Electrical conductivity: 8 to 16 mmhos/cm

Sodium adsorption ratio: 10 to 30

185—Ustic Torriorthents, moderately saline, 0 to 70 percent slopes

Composition

Ustic Torriorthents and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Hills

Slope: 0 to 70 percent

Elevation: 2,600 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Flooding: None

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

Inclusions

- Davidell soils on summits
- Antwerp soils on summits
- Deep soils in drainageways
- Strongly saline soils

Management

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

- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Ustic Torriorthents, Strongly Saline

Ustic Torriorthents, strongly saline, consist of shallow to very deep, well drained soils. These soils formed in alluvium or residuum derived from semiconsolidated shale. They are on sedimentary plains and hills. Slope is 0 to 15 percent. Elevation is 2,600 to 3,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the average frost-free period is 115 to 130 days.

Typical Pedon

Ustic Torriorthents, strongly saline, 0 to 8 percent slopes, in an area of rangeland, 1,320 feet south and 1,320 feet east of the northwest corner of sec. 6, T. 9 N., R. 35 E.

- E—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay loam that has a ½-inch massive surface crust, grayish brown (2.5Y 5/2) moist; weak thin platy structure; very hard, firm, sticky and plastic; few very fine roots; many very fine pores; slightly effervescent; mildly alkaline; clear smooth boundary.
- C1—3 to 8 inches; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; extremely hard, very firm, sticky and plastic; few very fine and fine roots; many very fine pores; slightly effervescent; mildly alkaline; clear smooth boundary.
- C2—8 to 60 inches; gray (10YR 6/1) and light yellowish brown (10YR 6/4) silty clay loam, dark gray (10YR 4/1) and yellowish brown (10YR 5/4) moist; massive; very hard, very firm, very sticky and very plastic; few very fine pores in the upper part; few fine masses of gypsum; strongly effervescent, strongly alkaline.

Range in Characteristics

Depth to Cr horizon: 10 to 60 inches or more
Texture: Silt loam, silty clay loam, silty clay, or clay
Clay content: 25 to 45 percent
Electrical conductivity: More than 16 mmhos/cm
Sodium adsorption ratio: 13 to 45

186—Ustic Torriorthents, strongly saline, 0 to 8 percent slopes

Composition

Ustic Torriorthents and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Sedimentary plains
Slope: 0 to 8 percent
Elevation: 2,700 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Drainage class: Well drained
Dominant parent material: Alluvium or residuum
Flooding: None

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

Inclusions

- Marvan and similar soils
- Vaeda and similar soils
- Areas of bentonite shale

Management

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

- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

187—Ustic Torriorthents, clayey-Volborg, saline, complex, 1 to 8 percent slopes

Composition

Ustic Torriorthents and similar soils: 50 percent
 Volborg and similar soils: 35 percent
 Inclusions: 15 percent

Setting

Landform:

- Ustic Torriorthents—Sedimentary plains
- Volborg—Sedimentary plains

Position on landform:

- Ustic Torriorthents—Back slopes and shoulders
- Volborg—Foot slopes

Slope:

- Ustic Torriorthents—2 to 8 percent
- Volborg—1 to 4 percent

Elevation: 2,800 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description**Ustic Torriorthents**

Dominant parent material: Alluvium or residuum

Flooding: None

Volborg

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Available water capacity: Mainly 1.5 inches

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

Inclusions

- Soils that are very shallow over shale
- Moderately deep, clayey soils

Management

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

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

Vaeda Series

The Vaeda series consists of very deep, well drained soils on alluvial fans, stream terraces, and sedimentary plains. These soils formed in alluvium. Slope is 0 to 4 percent. Elevation is 2,600 to 3,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic, nonacid, frigid Ustic Torriorthents

Typical Pedon

Vaeda silty clay, 0 to 4 percent slopes, in an area of rangeland, 2,400 feet east and 800 feet north of the southwest corner of sec. 21, T. 11 N., R. 35 E.

E—0 to 2 inches; light gray (2.5Y 7/2) silty clay that has a 1/8-inch massive surface crust, grayish brown (2.5Y 5/2) moist; massive; very hard, firm, sticky and plastic; few very fine roots; many very fine pores; mildly alkaline; clear smooth boundary.

Bw—2 to 9 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak coarse subangular blocky structure; extremely hard, very firm, sticky and plastic; common very fine and fine roots and common medium and coarse roots; many very fine pores; mildly alkaline; clear smooth boundary.

By1—9 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; extremely hard, very firm, very sticky and very plastic; common very fine roots in the upper part and few very fine roots in the lower part; common very fine pores; common fine and medium soft masses and seams of gypsum; mildly alkaline; gradual smooth boundary.

By2—30 to 40 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots; common very fine pores; few fine masses of gypsum; mildly alkaline; gradual smooth boundary.

By3—40 to 60 inches; gray (10YR 6/1) and light yellowish brown (10YR 6/4) silty clay, dark gray (10YR 4/1) and yellowish brown (10YR 5/4) moist; massive; very hard, very firm, very sticky and very plastic; few very fine roots and pores; few fine masses of gypsum; slightly acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

E horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 or 3

Clay content: 40 to 55 percent

Content of rock fragments: 0 to 15 percent pebbles

Electrical conductivity: 2 to 4 mmhos/cm

Sodium adsorption ratio: 0 to 5

Reaction: pH 5.6 to 7.8

Bw horizon

Hue: 10YR to 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 1 to 3
 Texture: Silty clay loam, silty clay, or clay
 Clay content: 35 to 60 percent
 Content of rock fragments: 0 to 15 percent pebbles
 Electrical conductivity: 4 to 16 mmhos/cm
 Sodium adsorption ratio: 10 to 20
 Reaction: pH 6.1 to 9.0

By horizon

Hue: 10YR to 5Y
 Value: 5 or 6 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: Silty clay loam, silty clay, or clay
 Clay content: 35 to 60 percent
 Content of rock fragments: 0 to 15 percent pebbles
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 25 to 40
 Content of gypsum: 1 to 5 percent
 Reaction: pH 5.1 to 7.8

188—Vaeda silty clay, 0 to 4 percent slopes**Composition**

Vaeda and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Alluvial fans and stream terraces
Slope: 0 to 4 percent
Elevation: 2,600 to 3,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 7.8 inches

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

Inclusions

- Gerdrum and similar soils
- Marvan and similar soils

Management

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

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

Vanda Series

The Vanda series consists of very deep, well drained soils on alluvial fans and stream terraces. These soils formed in alluvium. Slope is 0 to 4 percent. Elevation is 2,500 to 3,200 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic (calcareous), frigid Ustic Torriorthents

Typical Pedon

Vanda silty clay, 0 to 4 percent slopes, in an area of rangeland, 1,700 feet north and 300 feet west of the southeast corner of sec. 35, T. 11 N., R. 40 E.

- E1—0 to ½ inch; light brownish gray (2.5Y 6/2) silty clay loam, grayish brown (2.5Y 5/2) moist; massive crust; slightly hard, friable, sticky and plastic; few very fine roots and pores; strongly alkaline; abrupt smooth boundary.
- E2—½ inch to 2 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; weak medium angular blocky structure parting to moderate fine granular; hard, friable, sticky and very plastic; common very fine roots and pores; strongly alkaline; abrupt smooth boundary.
- Bw—2 to 7 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium angular blocky structure; hard, firm, very sticky and very plastic; common very fine roots and pores; slightly effervescent; strongly alkaline; clear smooth boundary.
- Byz1—7 to 43 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, very sticky and very plastic; few very fine roots; common very fine pores; many soft masses of gypsum and other salts; slightly effervescent; moderately alkaline; clear smooth boundary.
- Byz2—43 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, firm, sticky and plastic; few very fine

roots; common fine masses of gypsum and other salts; slightly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to Byz horizon: 4 to 24 inches

E horizon

Hue: 2.5Y or 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 1 to 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 30 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.9 to 9.6

Sodium adsorption ratio: 1 to 30

Bw horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 2 to 8 mmhos/cm

Reaction: pH 7.8 to 9.6

Sodium adsorption ratio: 13 to 30

Byz horizon

Hue: 2.5Y or 5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Clay, silty clay, or silty clay loam

Clay content: 35 to 60 percent

Electrical conductivity: 8 to 25 mmhos/cm

Sodium adsorption ratio: 13 to 30

Content of gypsum: 1 to 5 percent

Reaction: pH 7.8 to 9.6

189—Vanda silty clay, 0 to 4 percent slopes

Composition

Vanda and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Alluvial fans and stream terraces

Slope: 0 to 4 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.0 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Gerdrum and similar soils
- Marvan and similar soils

Management

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

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

Vanstel Series

The Vanstel series consists of very deep, well drained soils on alluvial fans, stream terraces, and sedimentary plains. These soils formed in alluvium. Slope is 0 to 8 percent. Elevation is 2,500 to 3,200 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-silty, mixed Borollic Haplargids

Typical Pedon

Vanstel loam, 2 to 8 percent slopes, in an area of rangeland, 1,300 feet north and 2,300 feet east of the southwest corner of sec. 5, T. 5 N., R. 40 E.

A—0 to 5 inches; brown (10YR 5/3) loam, brown (10YR 4/3) moist; weak thin platy structure; soft, very friable, slightly sticky and slightly plastic; many fine roots; mildly alkaline; clear smooth boundary.

Bt1—5 to 11 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; strong medium prismatic structure parting to strong angular blocky; hard, friable, sticky and plastic; many fine roots; many

very fine pores; continuous moderately thick clay films on faces of peds and in pores; mildly alkaline; clear smooth boundary.

Bt2—11 to 18 inches; pale brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure parting to strong medium angular blocky; slightly hard, friable, slightly sticky and plastic; common fine roots; many very fine pores; continuous thin clay films on faces of peds and in pores; mildly alkaline; clear smooth boundary.

Btk—18 to 24 inches; light gray (10YR 7/2) loam, grayish brown (2.5Y 5/2) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse angular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; many very fine tubular pores; common thin clay films on faces of peds and in pores; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC1—24 to 35 inches; light gray (10YR 7/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; strongly effervescent; moderately alkaline; gradual smooth boundary.

BC2—35 to 60 inches; very pale brown (10YR 7/3) loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Btk horizon: 10 to 18 inches

A horizon

Value: 5 or 6 dry

Chroma: 2 or 3

Texture: Loam or silt loam

Clay content: 14 to 25 percent

Reaction: pH 6.6 to 7.8

Bt horizon

Value: 5 or 6 dry

Chroma: 2 to 4

Texture: Loam, clay loam, or silty clay loam

Clay content: 25 to 35 percent

Reaction: pH 7.4 to 7.8

Btk horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 18 to 30 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR or 2.5Y

Value: 6 or 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 18 to 30 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.9 to 9.0

190—Vanstel loam, 2 to 8 percent slopes

Composition

Vanstel and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans

Slope: 2 to 8 percent

Elevation: 2,500 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Davidell soils on microlows
- Gerdrum soils on microlows
- Ivanell soils on back slopes
- Lonna and similar soils
- Vanstel soils on terrace treads

Management

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

- "Range" section
- "Agronomy" section

- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Volborg Series

The Volborg series consists of shallow, well drained soils on hills and sedimentary plains. These soils formed in residuum derived from semiconsolidated shale. Slope is 1 to 45 percent. Elevation is 2,700 to 3,300 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Clayey, montmorillonitic, acid, frigid, shallow Ustic Torriorthents

Typical Pedon

Volborg silty clay, 8 to 35 percent slopes, in an area of rangeland, 200 feet north and 25 feet east of the southwest corner of sec. 19, T. 8 N., R. 40 E.

- A—0 to 3 inches; grayish brown (10YR 5/2) silty clay, brown (10YR 4/3) moist; moderate very fine granular structure that has a weak, thin crust at the surface; soft, very friable, sticky and very plastic; common very fine roots; medium acid; abrupt smooth boundary.
- C—3 to 15 inches; grayish brown (10YR 5/2) silty clay, brown (10YR 4/3) moist; moderate very fine granular structure; hard, friable, sticky and very plastic; common very fine roots and pores; very strongly acid; clear wavy boundary.
- Cr—15 to 60 inches; light gray (10YR 6/1), semiconsolidated shale, dark gray (10YR 4/1) moist; common very fine roots matted at the top of the shale and in cracks in the upper 2 inches; common reddish brown (5YR 4/4) iron stains on shale fragments; common pale yellow (5Y 8/4) sulfur bands; extremely acid.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to bedrock: 10 to 20 inches; 10 to 14 inches in the saline phase

Note: The dark colors in these soils are lithochromic. In pedons that are less than 14 inches deep over consolidated shale, the pH is 5.5 or less.

A horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 3

Clay content: 40 to 50 percent

Electrical conductivity: Less than 4 mmhos/cm

Sodium adsorption ratio: 0 to 13; 5 to 13 in the saline phase

Reaction: pH 4.5 to 6.5

C horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 1 to 3

Texture: Silty clay loam, silty clay, or clay

Clay content: 35 to 50 percent

Content of rock fragments: 0 to 80 percent—0 to 30 percent soft fragments; 30 to 80 percent soft fragments in the saline phase

Electrical conductivity: 2 to 16 mmhos/cm; 8 to 16 mmhos/cm in the saline phase

Sodium adsorption ratio: 0 to 13; 5 to 13 in the saline phase

Reaction: pH 3.6 to 5.5

Cr horizon

Material: Semiconsolidated shale

Electrical conductivity: 8 to 16 mmhos/cm

Reaction: pH 3.6 to 5.5

191—Volborg silty clay, 8 to 35 percent slopes

Composition

Volborg and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Hills

Slope: 8 to 35 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Flooding: None

Available water capacity: Mainly 1.8 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Neldore and similar soils
- Soils that are moderately deep over shale
- Areas of rock outcrop

Management

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

- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

192—Volborg silty clay, saline, 1 to 4 percent slopes**Composition**

Volborg and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Sedimentary plains

Slope: 1 to 4 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay

Depth class: Shallow (10 to 14 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Available water capacity: Mainly 1.4 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Creed and similar soils
- Soils that are very shallow over shale
- Areas of hard rock concretions

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

193—Volborg, saline-Rock outcrop complex, 4 to 45 percent slopes**Composition**

Volborg and similar soils: 60 percent

Rock outcrop: 30 percent

Inclusions: 10 percent

Setting

Landform:

- Volborg—Hills

- Rock outcrop—Hills

Position on landform:

- Volborg—Back slopes

- Rock outcrop—Shoulders and summits

Slope:

- Volborg—4 to 45 percent

- Rock outcrop—4 to 45 percent

Elevation: 2,800 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description**Volborg**

Surface layer texture: Silty clay

Depth class: Shallow (10 to 14 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Available water capacity: Mainly 1.4 inches

Rock outcrop

Definition: Exposures of acid shale bedrock

Flooding: None

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Soils that are moderately deep over shale
- Areas of hard rock concretions

Management

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

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

W—Water

Description

Open areas of fresh water

Wayden Series

The Wayden series consists of shallow, well drained soils on hills. These soils formed in residuum derived from semiconsolidated shale. Slope is 8 to 70 percent. Elevation is 3,600 to 4,400 feet. The average annual precipitation is 15 to 19 inches, the average annual air temperature is about 42 degrees F, and the frost-free period is 100 to 120 days.

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Typic Ustorthents

Typical Pedon

Wayden silty clay loam, in an area of Sagedale-Cabba-Wayden complex, 8 to 25 percent slopes; in an area of rangeland, 100 feet west and 1,100 feet south of the northeast corner of sec. 13, T. 5 S., R. 39 E.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; soft, friable, sticky and plastic; slightly effervescent; moderately alkaline; clear wavy boundary.

C1—4 to 11 inches; light gray (2.5Y 7/2) silty clay loam, grayish brown (2.5Y 5/2) moist; moderate medium platy structure; slightly hard, friable, sticky and plastic; many fine and very fine roots and pores; strongly effervescent; moderately alkaline; clear wavy boundary.

Cr—11 to 60 inches; light gray (2.5Y 7/2), semiconsolidated shale that textures to silty clay loam, light brownish gray (2.5Y 6/2) moist; few fine and very fine roots matted in cracks in the upper few inches; few threads of lime in the upper part; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to bedrock: 10 to 20 inches

A horizon

Hue: 2.5Y or 5Y

Value: 5 to 7 dry; 3 to 5 moist

Chroma: 2 or 3

Clay content: 35 to 40 percent

Electrical conductivity: Less than 4 mmhos/cm

Reaction: pH 7.4 to 8.4

C horizon

Hue: 2.5Y or 5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 1 to 4

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

Clay content: 35 to 50 percent

Electrical conductivity: 0 to 8 mmhos/cm

Reaction: pH 7.4 to 8.4

Cr horizon

Material: Semiconsolidated shale

Weingart Series

The Weingart series consists of moderately deep, well drained soils on sedimentary plains and hills. These soils formed in residuum derived from semiconsolidated shale. Slope is 2 to 15 percent. Elevation is 2,700 to 3,200 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic Borollic Natrargids

Typical Pedon

Weingart clay, in an area of Weingart-Neldore complex, 4 to 25 percent slopes; in an area of rangeland, 300 feet south and 2,600 feet west of the northeast corner of sec. 10, T. 8 N., R. 44 E.

E—0 to 2 inches; light brownish gray (10YR 6/2) loam, brown (10YR 4/3) moist; weak medium platy structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; common very fine roots; 5 percent igneous pebbles; mildly alkaline; abrupt smooth boundary.

Btn—2 to 9 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium columnar structure; extremely hard, firm, sticky and plastic; common very fine roots; many very fine

pores; thin continuous clay films on faces of peds and common thin clay films in pores; 5 percent igneous pebbles; few medium soft masses of lime in the lower part; strongly effervescent; strongly alkaline; clear smooth boundary.

Bkn—9 to 16 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate coarse subangular blocky; extremely hard, firm, sticky and plastic; common very fine roots; many very fine pores; few medium soft masses of lime; strongly effervescent; very strongly alkaline; clear smooth boundary.

Bknyz—16 to 25 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (10YR 3/2) moist; massive; very hard, firm, sticky and plastic; few very fine roots; common very fine pores; common fine threads and soft masses of gypsum and other salts; moderately alkaline; clear smooth boundary.

Cr—25 to 60 inches; light brownish gray (2.5Y 6/2), semiconsolidated shale, grayish brown (2.5Y 5/2) moist; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature is 41 degrees F or higher

Depth to Bkn horizon: 7 to 16 inches

Depth to gypsum: 10 to 24 inches

Depth to bedrock: 20 to 40 inches

E horizon

Hue: 10YR or 2.5Y

Value: 5 to 7 dry; 3 to 6 moist

Chroma: 2 or 3

Texture: Clay or clay loam

Clay content: 30 to 45 percent

Content of 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 to 4

Texture: Clay, silty clay, or sandy clay

Clay content: 40 to 60 percent

Content of rock fragments: 0 to 10 percent—0 to 5 percent hard shale, 0 to 5 percent soft shale

Electrical conductivity: 2 to 8 mmhos/cm

Sodium adsorption ratio: 10 to 30

Reaction: pH 6.6 to 9.6

Bkn horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 or 5 moist

Chroma: 2 or 3

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

Clay content: 35 to 55 percent

Content of 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

Content of gypsum: 0 to 2 percent (occurring as few or common seams)

Calcium carbonate equivalent: 5 to 15 percent

Reaction: pH 7.8 to 9.6

Bknyz horizon

Hue: 10YR to 5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 1 to 4

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

Clay content: 35 to 55 percent

Content of rock fragments: 0 to 75 percent—0 to 30 percent hard shale, 0 to 55 percent soft shale

Electrical conductivity: 4 to 16 mmhos/cm

Sodium adsorption ratio: 13 to 30

Content of gypsum: 1 to 5 percent

Reaction: pH 7.8 to 9.6

Cr horizon

Material: Semiconsolidated shale

Reaction: pH more than 7.8

194—Weingart clay, 2 to 8 percent slopes

Composition

Weingart and similar soils: 90 percent

Inclusions: 10 percent

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Clay

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 3.1 inches

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

Inclusions

- Neldore and similar soils
- Gerdrum and similar soils

Management

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

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

195—Weingart-Neldore complex, 4 to 25 percent slopes

Composition

Weingart and similar soils: 55 percent
 Neldore and similar soils: 20 percent
 Inclusions: 25 percent

Setting

Landform:

- Weingart—Sedimentary plains
- Neldore—Hills

Position on landform:

- Weingart—Foot slopes
- Neldore—Back slopes

Slope:

- Weingart—4 to 8 percent
- Neldore—4 to 25 percent

Elevation: 2,700 to 3,000 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Weingart

Surface layer texture: Clay

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Flooding: None

Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 3.3 inches

Neldore

Surface layer texture: Silty clay

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.4 inches

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

Inclusions

- Gerdrum soils on foot slopes
- Cabbart soils on back slopes
- Cambeth soils on back slopes
- Lonna and similar soils
- Areas of rock outcrop
- Areas of gravelly soils

Management

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

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

196—Weingart-Niler-Rock outcrop complex, dissected, 2 to 25 percent slopes

Composition

Weingart and similar soils: 30 percent
 Niler and similar soils: 30 percent
 Rock outcrop: 25 percent
 Inclusions: 15 percent

Setting

Landform:

- Weingart—Hills
- Niler—Hills
- Rock outcrop—Hills

Position on landform:

- Weingart—Foot slopes
- Niler—Back slopes

- Rock outcrop—Shoulders and summits

Slope:

- Weingart—2 to 15 percent
- Niler—2 to 25 percent
- Rock outcrop—2 to 25 percent

Elevation: 2,700 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Weingart

Surface layer texture: Clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 3.3 inches

Niler

Surface layer texture: Clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.4 inches

Rock outcrop

Definition: Exposures of shale bedrock

Flooding: None

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Deep soils in drainageways
- Chinook and similar soils

Management

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

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

Yamac Series

The Yamac series consists of very deep, well drained soils on alluvial fans, stream terraces, sedimentary plains, and hills. These soils formed in alluvium. Slope is 0 to 25 percent. Elevation is 2,500 to 4,100 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine-loamy, mixed Borollic Camborthids

Typical Pedon

Yamac loam, 0 to 2 percent slopes, in an area of rangeland, 1,600 feet west and 600 feet south of the northeast corner of sec. 18, T. 1 S., R. 42 E.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium platy structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; mildly alkaline; clear smooth boundary.

Bw—5 to 14 inches; yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common very fine roots; many fine pores; mildly alkaline; clear wavy boundary.

Bk1—14 to 20 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; moderate thick platy structure parting to moderate fine subangular blocky; hard, friable, sticky and slightly plastic; common very fine roots; many fine pores; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—20 to 29 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine roots; many fine pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk3—29 to 45 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots; few soft threadlike masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

BC—45 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky and nonplastic; few very fine roots; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to Bk horizon: 10 to 20 inches

A horizon

Hue: 10YR to 5Y

Value: 5 or 6 dry; 3 to 5 moist

Chroma: 2 to 4

Clay content: 18 to 27 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 8.4

Bw horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or silt loam

Note: 15 to 35 percent of the sand is fine or coarser.

Clay content: 18 to 35 percent

Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles, 0 to 10 percent pebbles

Reaction: pH 6.6 to 8.4

Bk horizon

Hue: 10YR to 5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 2 to 4

Texture: Loam, clay loam, or silt loam

Note: 15 to 35 percent of the sand is fine or coarser.

Clay content: 18 to 35 percent

Content of 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: Strong or violent

Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR to 5Y

Value: 5 to 7 dry; 4 to 6 moist

Chroma: 2 to 4

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

Clay content: 5 to 35 percent

Content of 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

197—Yamac loam, 0 to 2 percent slopes**Composition**

Yamac and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 2,500 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

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 9.3 inches

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

Inclusions

- Busby and similar soils
- Forelle and similar soils
- Lonna and similar soils
- Very strongly saline soils

Management

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

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

198—Yamac loam, 2 to 8 percent slopes**Composition**

Yamac and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans

Slope: 2 to 8 percent
Elevation: 2,500 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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

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

Inclusions

- Busby and similar soils
- Delpoint and similar soils
- Lonna and similar soils
- Soils that are calcareous throughout
- Moderately saline soils

Management

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

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

199—Yamac loam, 8 to 15 percent slopes

Composition

Yamac and similar soils: 85 percent
 Inclusions: 15 percent

Setting

Landform: Sedimentary plains and alluvial fans
Slope: 8 to 15 percent
Elevation: 2,500 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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

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

Inclusions

- Busby and similar soils
- Coopers and similar soils
- Lonna and similar soils
- Cabbart soils on summits
- Delpoint soils on shoulders

Management

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

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

200—Yamac-Abor complex, 8 to 25 percent slopes

Composition

Yamac and similar soils: 40 percent
 Abor and similar soils: 30 percent
 Inclusions: 30 percent

Setting

Landform:
 • Yamac—Hills
 • Abor—Hills
Slope:
 • Yamac—8 to 15 percent
 • Abor—8 to 25 percent
Elevation: 2,700 to 3,100 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Yamac

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

Abor

Surface layer texture: Silty clay
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.2 inches

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

Inclusions

- Gerdrum soils on foot slopes
- Marvan soils on foot slopes
- Vaeda soils on foot slopes
- Birney soils on back slopes
- Cabbart soils on back slopes
- Areas of rock outcrop

Management

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

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

201—Yamac-Birney complex, 2 to 8 percent slopes

Composition

Yamac and similar soils: 50 percent
 Birney and similar soils: 30 percent
 Inclusions: 20 percent

Setting

- Landform:*
- Yamac—Sedimentary plains and alluvial fans
 - Birney—Sedimentary plains
- Position on landform:*
- Yamac—Foot slopes
 - Birney—Back slopes and shoulders

Slope:

- Yamac—2 to 8 percent
- Birney—2 to 8 percent

Elevation: 3,100 to 3,900 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Yamac

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

Birney

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.1 inches

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

Inclusions

- Busby and similar soils
- Coopers and similar soils
- Kirby soils on shoulders

Management

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

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

202—Yamac-Birney complex, 8 to 15 percent slopes

Composition

Yamac and similar soils: 50 percent
 Birney and similar soils: 35 percent
 Inclusions: 15 percent

Setting*Landform:*

- Yamac—Sedimentary plains and alluvial fans
- Birney—Sedimentary plains and alluvial fans

Position on landform:

- Yamac—Foot slopes
- Birney—Back slopes and shoulders

Slope:

- Yamac—8 to 15 percent
- Birney—8 to 15 percent

Elevation: 3,100 to 3,900 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 115 to 130 days**Component Description****Yamac***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**Birney***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.2 inches

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

Inclusions

- Busby and similar soils
- Kirby soils on summits
- Areas of soils that have igneous pebbles

Management

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

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

203—Yamac-Birney complex, 15 to 25 percent slopes**Composition**

Yamac and similar soils: 50 percent

Birney and similar soils: 40 percent

Inclusions: 10 percent

Setting*Landform:*

- Yamac—Hills
- Birney—Hills

Position on landform:

- Yamac—Foot slopes
- Birney—Back slopes and shoulders

Slope:

- Yamac—15 to 25 percent
- Birney—15 to 25 percent

Elevation: 3,100 to 3,900 feet*Mean annual precipitation:* 10 to 14 inches*Frost-free period:* 115 to 130 days**Component Description****Yamac***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**Birney***Surface layer texture:* Channery loam*Depth class:* Very deep (more than 60 inches)*Drainage class:* Well drained*Dominant parent material:* Colluvium*Native plant cover type:* Rangeland*Flooding:* None*Available water capacity:* Mainly 4.1 inches

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

Inclusions

- Kirby soils on back slopes
- Areas of rock outcrop
- Areas of soils that have igneous pebbles

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

204—Yamac-Birney-Cabbart complex, 15 to 25 percent slopes

Composition

Yamac and similar soils: 45 percent
 Birney and similar soils: 20 percent
 Cabbart and similar soils: 20 percent
 Inclusions: 15 percent

Setting

Landform:

- Yamac—Hills
- Birney—Hills
- Cabbart—Hills

Position on landform:

- Yamac—Foot slopes
- Birney—Back slopes and shoulders
- Cabbart—Shoulders and summits

Slope:

- Yamac—15 to 25 percent
- Birney—15 to 25 percent
- Cabbart—15 to 25 percent

Elevation: 3,100 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Yamac

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

Birney

Surface layer texture: Channery loam

Depth class: Very deep (more than 60 inches)

Drainage class: Well drained

Dominant parent material: Colluvium

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.2 inches

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.8 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Busby soils on foot slopes
- Delpoint soils on back slopes
- Yawdim soils on back slopes
- Areas of soils that have igneous pebbles

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

205—Yamac-Busby complex, 2 to 8 percent slopes

Composition

Yamac and similar soils: 50 percent

Busby and similar soils: 40 percent

Inclusions: 10 percent

Setting

Landform:

- Yamac—Sedimentary plains and alluvial fans
- Busby—Sedimentary plains and alluvial fans

Slope:

- Yamac—2 to 8 percent
- Busby—2 to 8 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Yamac

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 9.1 inches

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 8.2 inches

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

Inclusions

- Yetull soils on back slopes
- Areas of rock outcrop on summits

Management

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

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

206—Yamac-Busby complex, 8 to 15 percent slopes**Composition**

Yamac and similar soils: 50 percent
 Busby and similar soils: 40 percent
 Inclusions: 10 percent

Setting**Landform:**

- Yamac—Hills
- Busby—Alluvial fans

Slope:

- Yamac—8 to 15 percent
- Busby—8 to 15 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description**Yamac**

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

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 8.2 inches

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

Inclusions

- Blackhall soils on shoulders
- Yetull soils on back slopes
- Areas of rock outcrop on summits

Management

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

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

207—Yamac-Cabbart loams, 8 to 25 percent slopes**Composition**

Yamac and similar soils: 50 percent
 Cabbart and similar soils: 30 percent
 Inclusions: 20 percent

Setting**Landform:**

- Yamac—Hills
- Cabbart—Hills

Position on landform:

- Yamac—Foot slopes

- Cabbart—Back slopes and shoulders

Slope:

- Yamac—8 to 15 percent
- Cabbart—8 to 25 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description**Yamac**

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

Cabbart

Surface layer texture: Loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.1 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Birney soils on back slopes
- Delpoint soils on back slopes
- Redcreek soils on summits
- Areas of rock outcrop on summits

Management

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

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

208—Yamac-Delpoint loams, 4 to 15 percent slopes**Composition**

Yamac and similar soils: 50 percent

Delpoint and similar soils: 35 percent

Inclusions: 15 percent

Setting**Landform:**

- Yamac—Alluvial fans
- Delpoint—Hills

Slope:

- Yamac—4 to 15 percent
- Delpoint—4 to 15 percent

Elevation: 2,600 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description**Yamac**

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

Delpoint

Surface layer texture: Loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 4.6 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Busby soils on foot slopes
- Cabbart soils on shoulders
- Redcreek soils on shoulders
- Areas of rock outcrop on summits

Management

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

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

209—Yamac-Redcreek loams, 2 to 15 percent slopes

Composition

Yamac and similar soils: 40 percent
Redcreek and similar soils: 40 percent
Inclusions: 20 percent

Setting

Landform:

- Yamac—Hills
- Redcreek—Sedimentary plains

Position on landform:

- Yamac—Back slopes
- Redcreek—Summits

Slope:

- Yamac—2 to 15 percent
- Redcreek—2 to 8 percent

Elevation: 3,100 to 3,800 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Yamac

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

Redcreek

Surface layer texture: 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 2.6 inches

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

Inclusions

- Birney soils on back slopes
- Busby soils on back slopes
- Cabbart soils on shoulders

Management

For general and detailed information about managing

this map unit, see the following sections in Part II of this publication:

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

210—Yamac-Rominell, eroded, complex, 2 to 8 percent slopes

Composition

Yamac and similar soils: 50 percent
Rominell and similar soils: 30 percent
Inclusions: 20 percent

Setting

Landform:

- Yamac—Sedimentary plains and alluvial fans
- Rominell—Sedimentary plains and alluvial fans

Position on landform:

- Yamac—Foot slopes
- Rominell—Toe slopes

Slope:

- Yamac—2 to 8 percent
- Rominell—2 to 8 percent

Elevation: 2,500 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Yamac

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

Rominell

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

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 7.6 inches

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

Inclusions

- Abor soils on shoulders
- Marvan soils on foot slopes
- Neldore soils on shoulders
- Vaeda soils on foot slopes

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Yawdim Series

The Yawdim series consists of shallow, well drained soils on sedimentary plains and hills. These soils formed in residuum derived from semiconsolidated shale. Slope is 2 to 70 percent. Elevation is 2,600 to 3,900 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Clayey, montmorillonitic (calcareous), frigid, shallow Ustic Torriorthents

Typical Pedon

Yawdim silty clay loam, in an area of Cabbart-Yawdim-Rock outcrop complex, 15 to 70 percent slopes; in an area of rangeland, 1,400 feet south and 2,400 feet east of the northwest corner of sec. 5, T. 1 S., R. 42 E.

- A—0 to 2 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium granular structure; slightly hard, very friable, sticky and plastic; many very fine roots; many fine pores; mildly alkaline; clear smooth boundary.
- C1—2 to 9 inches; light gray (2.5Y 7/2) silty clay loam, olive gray (5Y 5/2) moist; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; many very fine roots and pores; strongly effervescent; moderately alkaline; clear wavy boundary.
- C2—9 to 13 inches; light gray (5Y 7/2) silty clay loam, olive gray (5Y 5/2) moist; massive; hard, friable, sticky and plastic; many very fine roots; common fine pores; 40 percent soft shale fragments; strongly effervescent; moderately alkaline; clear smooth boundary.
- Cr—13 to 60 inches; light gray (5Y 7/2), semiconsolidated shale that textures to silty clay

loam, olive gray (5Y 5/2) moist; very fine roots in mat at top of horizon; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches

Depth to 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

Texture: Silty clay or silty clay loam

Clay content: 27 to 50 percent

Reaction: pH 6.6 to 7.8

C horizons

Hue: 10YR to 5Y

Value: 5 to 8 dry; 4 to 6 moist

Chroma: 1 to 4

Texture: Silty clay loam, clay loam, or clay

Clay content: 35 to 50 percent

Calcium carbonate equivalent: 5 to 10 percent

Reaction: pH 7.4 to 8.4

211—Yawdim silty clay loam, 2 to 8 percent slopes

Composition

Yawdim and similar soils: 85 percent

Inclusions: 15 percent

Setting

Landform: Sedimentary plains

Slope: 2 to 8 percent

Elevation: 3,000 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.4 inches

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

Inclusions

- Orinoco and similar soils
- Soils that are very shallow over shale
- Areas of hard rock concretions

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

212—Yawdim-Cabbart-Kobar complex, 15 to 70 percent slopes**Composition**

Yawdim and similar soils: 30 percent
Cabbart and similar soils: 30 percent
Kobar and similar soils: 25 percent
Inclusions: 15 percent

Setting**Landform:**

- Yawdim—Hills
- Cabbart—Hills
- Kobar—Alluvial fans

Position on landform:

- Yawdim—Back slopes and shoulders
- Cabbart—Back slopes and shoulders

Slope:

- Yawdim—15 to 70 percent
- Cabbart—15 to 70 percent
- Kobar—15 to 25 percent

Elevation: 2,700 to 3,900 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description**Yawdim**

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 1.7 inches

Cabbart

Surface layer texture: Silt loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated, loamy sedimentary beds

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 2.1 inches

Kobar

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 9.7 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section, Part II of this publication.

Inclusions

- Cambeth soils on back slopes
- Delpoint soils on back slopes
- Lonna soils on foot slopes
- Yamac soils on foot slopes
- Areas of rock outcrop on summits

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

213—Yawdim-Orinoco silty clay loams, 2 to 8 percent slopes**Composition**

Yawdim and similar soils: 60 percent

Orinoco and similar soils: 25 percent

Inclusions: 15 percent

Setting**Landform:**

- Yawdim—Sedimentary plains
- Orinoco—Sedimentary plains

Position on landform:

- Yawdim—Back slopes and shoulders
- Orinoco—Back slopes and foot slopes

Slope:

- Yawdim—2 to 8 percent
- Orinoco—2 to 8 percent

Elevation: 3,000 to 3,300 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Yawdim

Surface layer texture: Silty clay loam

Depth class: Shallow (10 to 20 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Available water capacity: Mainly 3.0 inches

Orinoco

Surface layer texture: Silty clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 4.3 inches

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

Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section, Part II of this publication.

Inclusions

- Absher and similar soils
- Nobe and similar soils
- Volborg and similar soils
- Areas of slick spots

Management

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

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

Yetull Series

The Yetull series consists of very deep, somewhat excessively drained soils on hills and sedimentary

plains. These soils formed in alluvium or eolian material. Slope is 2 to 25 percent. Elevation is 3,000 to 3,900 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Mixed, frigid Ustic Torripsamments

Typical Pedon

Yetull loamy fine sand, in an area of Busby-Yetull complex, 8 to 25 percent slopes; in an area of rangeland, 300 feet west and 2,600 feet north of the southeast corner of sec. 24, T. 1 S., R. 4 E.

A—0 to 5 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak medium and thick platy structure; soft, very friable, nonsticky and nonplastic; many very fine roots; mildly alkaline; gradual smooth boundary.

C1—5 to 24 inches; pale brown (10YR 6/3) loamy fine sand, brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, very friable, nonsticky and nonplastic; common very fine roots; common fine pores; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—24 to 60 inches; pale brown (10YR 6/3) fine sand, yellowish brown (10YR 5/4) moist; single grain; loose, nonsticky and nonplastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

Moisture control section: Between the depths of 12 and 35 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

A horizon

Hue: 10YR to 2.5Y

Value: 5 or 6 dry; 3 or 4 moist

Chroma: 2 to 4

Clay content: 0 to 10 percent

Content of rock fragments: 0 to 60 percent—0 to 5 percent cobbles, 0 to 55 percent pebbles

Calcium carbonate equivalent: 0 to 10 percent

Reaction: pH 6.6 to 7.8

C1 horizon

Hue: 10YR or 2.5Y

Value: 4 to 6 dry; 4 or 5 moist

Chroma: 2 to 4

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

Clay content: 0 to 10 percent

Content of rock fragments: 0 to 15 percent pebbles

Calcium carbonate equivalent: 1 to 10 percent

Effervescence: Slight or strong
Reaction: pH 7.4 to 8.4

C2 horizon

Hue: 10YR or 2.5Y
Value: 4 to 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Sand, fine sand, loamy sand, loamy coarse sand, loamy fine sand, or coarse sand
Clay content: 0 to 10 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 3 to 10 percent
Effervescence: Slight to violent
Reaction: pH 7.4 to 8.4

Zatoville Series

The Zatoville series consists of deep and very deep, well drained and somewhat poorly drained soils on sedimentary plains and stream terraces. These soils formed in alluvium or residuum. Slope is 0 to 8 percent. Elevation is 2,400 to 3,200 feet. The average annual precipitation is 10 to 14 inches, the average annual air temperature is about 45 degrees F, and the frost-free period is 115 to 130 days.

Taxonomic Class: Fine, montmorillonitic, frigid Cambic Gypsiorthids

Typical Pedon

Zatoville silty clay loam, in an area of Zatoville-Orinoco silty clay loams, 2 to 8 percent slopes; in an area of rangeland, 1,800 feet west and 400 feet north of the southeast corner of sec. 5, T. 11 N., R. 38 E.

A—0 to 3 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, sticky and plastic; common very fine and few fine roots; many very fine pores; mildly alkaline; abrupt smooth boundary.

Bw—3 to 12 inches; brown (10YR 5/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure; very hard, firm, sticky and plastic; common very fine roots; many very fine pores; slightly effervescent; mildly alkaline; clear smooth boundary.

Bk—12 to 21 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common very fine roots; many very fine pores; few fine soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

By—21 to 46 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist;

weak coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots; common very fine pores; few yellow (10YR 7/6) iron stains; common fine soft masses of gypsum; strongly effervescent; moderately alkaline; abrupt smooth boundary.

BC—46 to 52 inches; gray (10YR 5/1) silty clay loam, very dark gray (10YR 3/1) moist; massive; hard, firm, sticky and plastic; few very fine roots and pores; common reddish yellow (7.5YR 6/6) iron stains; medium acid; clear smooth boundary.

Cr—52 to 60 inches; gray (10YR 5/1), semiconsolidated shale that textures to silty clay loam, very dark gray (10YR 3/1) moist; very hard, very firm, sticky and plastic; few primary gypsum crystals; very strongly acid.

Range in Characteristics

Soil temperature: 43 to 47 degrees F

Moisture control section: Between the depths of 4 and 12 inches, dry in all parts between 40 and 50 percent of the cumulative days per year when the soil temperature at a depth of 20 inches is 41 degrees F or higher

Depth to By horizon: 13 to 24 inches

Depth to shale: 40 to 60 inches or more

A horizon

Hue: 10YR or 2.5Y; 2.5Y in the moderately wet phase

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay or silty clay loam

Clay content: 30 to 45 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

Bw horizon

Hue: 10YR or 2.5Y;

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam or silty clay

Clay content: 30 to 45 percent

Electrical conductivity: 0 to 4 mmhos/cm

Reaction: pH 7.4 to 9.0

Bk horizon

Hue: 10YR or 2.5Y

Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 or 3

Texture: Silty clay loam or silty clay

Clay content: 35 to 45 percent

Calcium carbonate equivalent: 5 to 15 percent

Electrical conductivity: 4 to 8 mmhos/cm

Sodium adsorption ratio: 0 to 13

Reaction: pH 7.9 to 9.0

By horizon

Hue: 10YR to 5Y
 Value: 5 to 7 dry; 4 or 5 moist
 Chroma: 2 or 3
 Texture: Silty clay loam or silty clay
 Clay content: 30 to 45 percent
 Electrical conductivity: 8 to 16 mmhos/cm
 Sodium adsorption ratio: 8 to 30
 Content of gypsum: 10 to 20 percent
 Reaction: pH 7.9 to 9.0

BC horizon

Hue: 10YR to 5Y or neutral
 Value: 4 to 7 dry; 3 to 5 moist
 Chroma: 1 or 2
 Texture: Silty clay loam, loam, or silty clay
 Clay content: 35 to 50 percent
 Electrical conductivity: 8 to 30 mmhos/cm
 Sodium adsorption ratio: 13 to 35
 Content of gypsum: 1 to 5 percent
 Reaction: pH 5.6 to 9.0

214—Zatoville silty clay loam, 1 to 4 percent slopes

Composition

Zatoville and similar soils: 90 percent
 Inclusions: 10 percent

Setting

Landform: Sedimentary plains
Slope: 1 to 4 percent
Elevation: 3,100 to 3,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

Component Description

Surface layer texture: Silty clay loam
Depth class: Deep (40 to 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or residuum
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 5.5 inches

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

Inclusions

- Vaeda and similar soils

Management

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

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

215—Zatoville silty clay loam, loamy substratum, 0 to 2 percent slopes

Composition

Zatoville and similar soils: 90 percent
 Inclusions: 10 percent

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 2,400 to 3,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 115 to 130 days

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
Salt affected: Saline within a depth of 30 inches
Sodium affected: Sodic within a depth of 30 inches
Available water capacity: Mainly 7.7 inches

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

Inclusions

- Kobar and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

216—Zatoville silty clay, moderately wet, 0 to 2 percent slopes

Composition

Zatoville and similar soils: 85 percent
Inclusions: 15 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Elevation: 2,400 to 3,100 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

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: None

Water table: Apparent

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 5.6 inches

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

Inclusions

- Kobar and similar soils
- Spinekop and similar soils

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

217—Zatoville-Orinoco silty clay loams, 2 to 8 percent slopes

Composition

Zatoville and similar soils: 55 percent

Orinoco and similar soils: 35 percent

Inclusions: 10 percent

Setting

Landform:

- Zatoville—Sedimentary plains
- Orinoco—Sedimentary plains

Position on landform:

- Zatoville—Summits
- Orinoco—Back slopes

Slope:

- Zatoville—2 to 8 percent
- Orinoco—2 to 8 percent

Elevation: 3,100 to 3,200 feet

Mean annual precipitation: 10 to 14 inches

Frost-free period: 115 to 130 days

Component Description

Zatoville

Surface layer texture: Silty clay loam

Depth class: Deep (40 to 60 inches)

Drainage class: Well drained

Dominant parent material: Alluvium

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 6.7 inches

Orinoco

Surface layer texture: Silty clay loam

Depth class: Moderately deep (20 to 40 inches)

Drainage class: Well drained

Dominant parent material: Semiconsolidated shale residuum

Native plant cover type: Rangeland

Flooding: None

Salt affected: Saline within a depth of 30 inches

Sodium affected: Sodic within a depth of 30 inches

Available water capacity: Mainly 4.0 inches

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

Inclusions

- Yawdim soils on shoulders
- Vaeda soils in drainageways

Management

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

- “Range” section
- “Agronomy” section
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

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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 wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board one foot wide, one foot long, and one inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep or very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition from woody vegetation and thus to allow understory grasses and forbs to recover or to make conditions favorable for reseeding. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, a felled tree generally is reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed

limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Cirque. A semicircular, concave, bowl-like area that has steep faces primarily resulting from erosive activity of a mountain glacier.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting.

Reproduction is achieved artificially or by natural seeding from adjacent stands.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

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 25.4 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forest land capable of producing 20 cubic feet or more per acre per year at the culmination of mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material.

Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the soil surface after planting in order to reduce the hazard of water erosion; in areas where soil blowing is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or the equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The

fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deep soil. A soil that is 40 to 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of

digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the hazard of water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit the use of a full stripcropping pattern.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of some field crops are adversely affected unless a drainage system is installed. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that

planting or harvesting operations or crop growth is markedly restricted unless a drainage system is installed. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poorly drained conditions are caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except rice) unless a drainage system is installed.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Dune. A mound, ridge, or hill of loose, windblown granular material (generally sand), either bare or covered with vegetation.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between the individuals. A range of 20 years is allowed.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

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 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 underlying 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.

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. Crops such 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 the less palatable to livestock.
- Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.
- Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.
- Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.
- Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate

1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

- 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 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.
- 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 commonly of limited summit area and generally having steep sides (slopes greater than 25 percent) and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range. Mountains are primarily formed by deep-seated earth movements or volcanic action and secondarily by differential erosion.
- Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)
- Mudstone.** Sedimentary rock formed by induration of silt and clay in approximately equal amounts.
- Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma.

For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Overstory. The trees in a forest that form the upper crown cover.

Oxbow. The horseshoe-shaped channel of a former meander, remaining after the stream formed a cutoff across a narrow meander neck.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid.....	2.0 to 6.0 inches

Rapid

6.0 to 20 inches

Very rapid

more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth).

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Quartzite, metamorphic. Rock consisting mainly of quartz that formed through recrystallization of quartz-rich sandstone or chert.

Quartzite, sedimentary. Very hard but unmetamorphosed sandstone consisting chiefly of quartz grains.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata mainly red in color and composed largely of sandstone and shale.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relict stream terrace. One of a series of platforms in or adjacent to a stream valley that formed prior to the current stream system.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Riser. The relatively short, steeply sloping area below a terrace tread that grades to a lower terrace tread or base level.

Riverwash. Unstable areas of sandy, silty, clayey, or gravelly sediments. These areas are flooded, washed, and reworked by rivers so frequently that they support little or no vegetation.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubble land. Areas that have more than 90 percent of the surface covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount

that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Salinity. The electrical conductivity of a saline soil. It is expressed, in millimhos per centimeter, as follows:

Nonsaline	0 to 4
Slightly saline	4 to 8
Moderately saline.....	8 to 16
Strongly saline.....	more than 16

Salty water (in tables). Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by sedimentary bedrock and that has a slope of 0 to 8 percent.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sedimentary uplands. Land areas of bedrock formed from water- or wind-deposited sediments. They are higher on the landscape than the flood plain.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Semiconsolidated sedimentary beds. Soft geologic sediments that disperse when fragments are placed in water. The fragments are hard or very

hard when dry. Determining the texture by the usual field method is difficult.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shallow soil. A soil that is 10 to 20 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder. The uppermost inclined surface at the top of a hillside. It is the transition zone from the back slope to the summit of a hill or mountain. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant or dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slickens. Accumulations of fine-textured material, such as material separated in placer-mine and ore-mill operations. Slickens from ore mills commonly consist of freshly ground rock that has undergone chemical treatment during the milling process.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is loamy or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

In this survey the following slope classes are recognized:

Nearly level.....	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping.....	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep.....	more than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na⁺ to Ca⁺⁺ + 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 6 to 15 inches (15 to 38 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.

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). Otherwise suitable soil material 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 depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in

stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

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.

Waterspreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

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