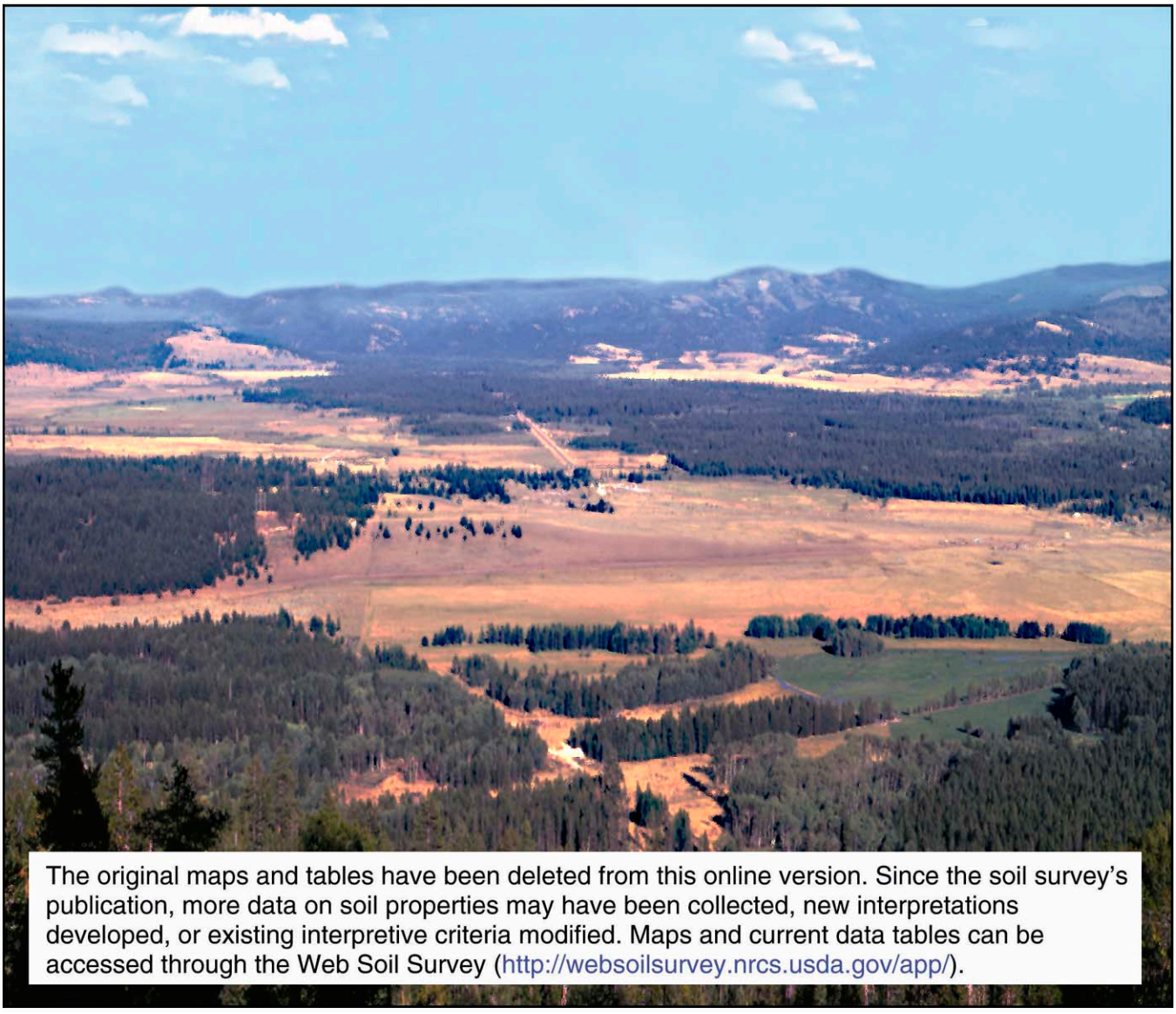
United States Department of Agriculture

In cooperation with the Montana Agricultural Experiment Station

Natural Resources Conservation Service

MT630—Soil Survey of Lewis and Clark County Area, Montana

Part I



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

How to Use This Soil Survey

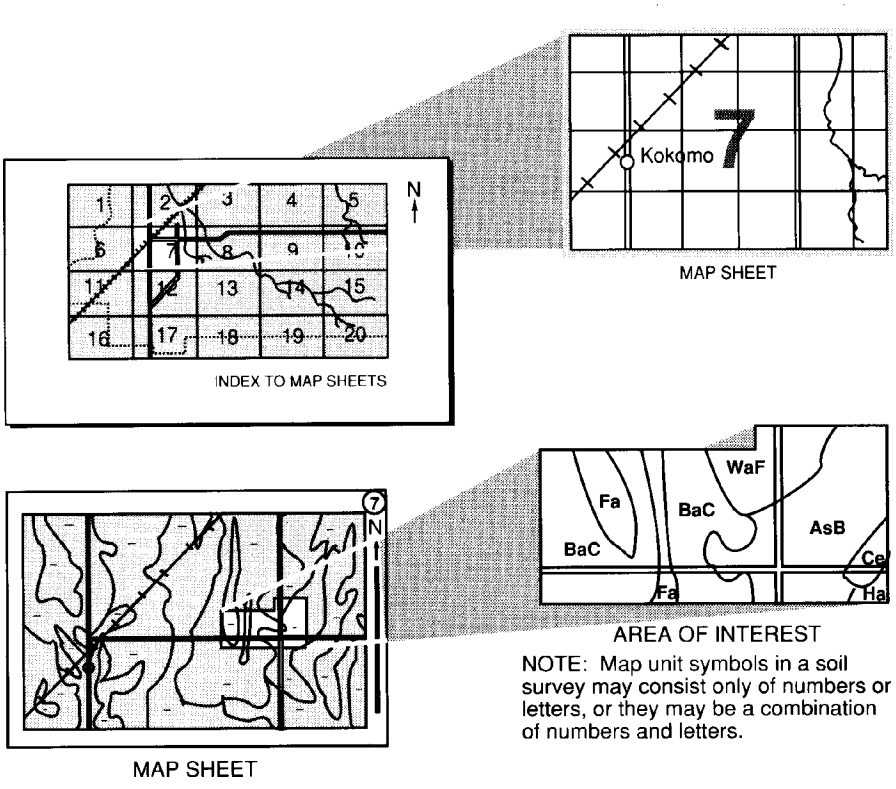
Detailed Soil Maps

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

To find information about your area of interest, you can locate the Section, Township, and Range by zooming in on the **Index to Map Sheets**, or you can go to the Web Soil Survey at (http://websoilsurvey.nrcs.usda.gov/app/).

Note the map unit symbols that are in that area. The **Contents** lists the map units by symbol and name and shows the page where each map unit is described.

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



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

Major fieldwork for this soil survey was completed in 1987. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service and the Montana Agricultural Experiment Station. It is part of the technical assistance furnished to the Lewis and Clark Conservation District. Financial assistance was provided by the Old West Regional Commission through the Montana Department of State Lands and the Montana Association of Conservation Districts.

The most current official data are available through the NRCS Soil Data Mart website at http://soildatamart.nrcs.usda.gov. 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: View of the Lincoln Valley area in the western part of Lewis and Clark County. The soils in this area are used mainly for woodland, rangeland, and irrigated hayland.

Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at http://www.nrcs.usda.gov.

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Summary of Tables

For tables with the most current data, please visit the Soil Data Mart at **http://soildatamart.nrcs.usda.gov/.**

Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil.

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.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

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

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

Dave White
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Lewis and Clark County Area, Montana

Fieldwork by Lamonte C. Bingham, Mervyn H. Haub, Patrick E. McCain, and J. Art Olsen, Natural Resources Conservation Service

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

Lewis and Clark County Area is located in west-central Montana (fig. 1). The survey area consists of all of the land in Lewis and Clark County except federal land within the Helena and Lewis and Clark National Forests. Included in this survey are approximately 12,000 acres south of Helena and several thousand acres of privately owned land within national forest boundaries. The survey area includes 1,223,900 acres and covers approximately 1,912 square miles.

Helena, in the extreme southern part of the survey area, is the county seat and capital city of Montana. The Continental Divide and the main range of the Rocky Mountains extend through the western section of the survey area. Part of the survey area extends west of the Continental Divide to include the town of Lincoln, the Lincoln Valley, and some of the surrounding mountains. The southern boundary is just north of the Elkhorn Mountains. The Big Belt Mountains are along the eastern boundary. The northern boundary is the Sun River and its North Fork. From the southeastern corner, the Missouri River flows through the survey area in a northerly direction and leaves the survey area south of the town of Craig. Canyon Ferry, Hauser, and Holter Dams have been constructed on the Missouri River. Each dam has created a large reservoir.

The survey area includes about 60 percent rangeland, 25 percent woodland, 10 percent cropland, and 5 percent urban or built-up areas. The main economic enterprises are farming, ranching, logging, and mining. The main agricultural crops are wheat, barley, alfalfa hay, grass hay, and pasture.

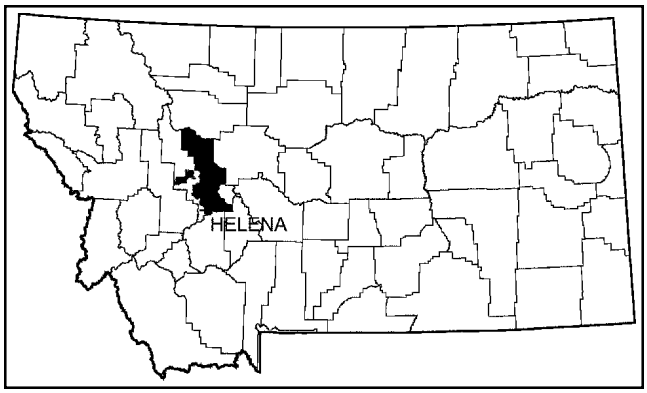

Figure 1.—Location of Lewis and Clark County Area, Montana.

Elevation in the survey area ranges from about 3,500 to 7,800 feet. Mean annual precipitation ranges from 10 to 30 inches. Mean annual air temperature ranges from 34 to 45 degrees F, and the frost-free period ranges from 50 to 120 days.

This soil survey updates the “Soils of Lewis and Clark County: Soil Reconnaissance of Montana” (USDA, 1947). The present survey provides additional information and has larger maps that show the soils in greater detail.

General Nature of the Survey Area

This section describes some of the environmental and cultural features that affect the use and management of soils in the survey area. These features are history; industry, transportation, and

recreation; water resources; physiography, drainage, and geology; and climate.

History

On July 19, 1805, Captain Meriweather Lewis ascended the Missouri River into the area covered by this report. In his journal, he described an area along the river, giving it the name “Gates of the Mountains” by which it is still known. His partner, Captain William Clark, traveled overland, accumulating data in his journal. Many of his descriptive names continue to be used today. The association with these famous explorers resulted in the name of Lewis and Clark County.

The Lewis and Clark County Area was used as hunting grounds for the Blackfeet Indian Tribe. Trapping and trading were the major industries of the survey area until 1864 when placer gold was discovered in the Helena area and the Elkhorn and Big Belt Mountains. Gold-bearing quartz veins were also discovered at this time but were not extensively worked until transportation facilities were developed.

The history of agriculture in the survey area began simultaneously with the first discovery of gold. In the early 1860s, many immigrants moved to Montana for mining but discovered no claims were available. As a second choice, they turned to farming and raising livestock. In the early 1870s, the first livestock arrived in the Sun River and Helena valleys from Fort Shaw, Montana. At about the same time, sheep were trailed in from the Oregon Territory. Land taken up by early stockmen was mainly bottomland that had access to water. This land was suitable for pasture, production of wild hay, and winter grazing.

In 1875, as a result of action by the Territorial Legislature, Helena became the capital of the Montana Territory. In 1889, Helena became the capital of Montana.

Public domain land was largely under control of stockmen and miners until the national forests were created. In approximately 1906, various state agencies began developing the agricultural resources of Montana. Because of favorable climatic conditions for crop production, these agencies were instrumental in establishing large portions of public domain land for farming. Land filed upon under the Homestead and Desert Acts was in the foothills and intermountain basins. Much land was placed under cultivation between 1908 and 1915. However, many of these areas were poorly suited to cultivation and were soon abandoned or seeded back to grass. Farmers and ranchers soon learned the importance of irrigation. By diverting water into usually low-producing areas, they were able to produce crops with assured success.

Industry, Transportation, and Recreation

The main industries in the survey area include livestock, farming, logging, and small mining operations. Helena also contains numerous small businesses and employment opportunities for government employees.

The livestock industry is mainly cow-calf operations and accounts for about 75 percent of farm and ranch income. The main crops grown on nonirrigated land are winter wheat and spring wheat. The main crops grown on irrigated land are spring wheat, barley, alfalfa, grass for hay, and pasture.

Public stockyards in the towns of Bozeman, Butte, and Great Falls provide good livestock marketing facilities. Cattle and sheep are sold both locally and out of state. Most wheat produced is transported out of state by truck or rail. Alfalfa hay and grass hay are used mostly for local livestock.

Several trucking firms, located in Helena, provide transportation services. The Burlington Northern Santa Fe and Montana Rail Link provide railroad service to the survey area and facilitate shipment of freight to eastern and western markets.

The survey area contains a good system of highways and roads. U.S. Highway 12 parallels the Montana Rail Link through the southern portion of the survey area. Interstate 15 enters the county about 15 miles south of Helena and parallels the Burlington Northern Santa Fe to Great Falls. U.S. Highway 287 travels north from Interstate 15, near Wolf Creek, to Augusta in the northern part of the survey area. State Highway 279 leaves Interstate 15 just north of Helena, travels northwest over Flesher Pass on the Continental Divide, meeting State Highway 200 in the western part of the survey area. Highway 200 travels west through the town of Lincoln before exiting the county. From the junction of Highways 200 and 279 east of Lincoln, Highway 200 travels northeast over Rogers Pass on the Continental Divide, through the central part of the survey area, and exits the county near the town of Simms. U.S. Highway 21 travels east from Augusta, following the Sun River in the northern part of the survey area and exiting the county near Simms. Other secondary highways and county roads also provide good vehicular traffic throughout the survey area.

Recreational opportunities abound. The surrounding mountains provide for activities such as camping, fishing, hiking, hunting, and sightseeing. The mountains contain many big game species and

upland game birds. Many streams and reservoirs in the survey area provide excellent fishing and other water-related activities.

Water Resources

Many perennial streams provide a limited amount of water for irrigation and other uses. Water from Prickly Pear Creek, Ten Mile Creek, and the South Fork of Little Prickly Pear Creek is used for irrigation in the southern part of the survey area.

Water is taken from below Canyon Ferry Dam to irrigate land in the Helena Valley. The U.S. Bureau of Reclamation built this project, called the Helena Valley Unit. It provides irrigation water for approximately 15,000 acres of land. The pumping plant consists of two hydraulic turbine-driven centrifugal pumps and is located about 500 feet downstream from Canyon Ferry Dam. Each pump is designed to pump 150 cubic feet per second, at a total head of 145 feet. Reservoir water is lifted to the Helena Valley Tunnel and flows, by gravity, through the Helena Valley Canal to the regulatory reservoir on the east side of the valley. This reservoir has a 10,600 acre-feet capacity. From the regulatory reservoir, water flows into a canal that runs around nearly the entire bowl-shaped valley. The diversion and storage works of the Helena Valley Unit also provide municipal and industrial water to Helena.

Water from the Missouri River irrigates some small areas below Holter Dam. The Dearborn River provides a limited amount of water to irrigate the central part of the survey area. The Dearborn Canal diverts water from the North Fork of the Dearborn River into the headwaters of Flat Creek. Several thousand acres along Flat Creek are irrigated with this water.

In the northern part of the survey area, water is diverted from Ford and Smith Creeks and is stored in the Nilan Reservoir, located about 7 miles southwest of Augusta. From this project, several thousand acres are irrigated along the Elk, Smith, and Willow Creeks near Augusta. The Sun River also provides some irrigation water.

The Blackfoot River and some of its tributaries in the western part of the survey area provide a limited amount of water to irrigate several hundred acres in the Lincoln Valley.

Ground-water information for much of the survey area is limited. Good quality water probably exists in the alluvium of the many mountain valleys. Cretaceous aquifers in the northeastern portion of the survey area are known to contain water, but it is of variable quality. Water from Quaternary deposits is generally good quality, with wells often producing up to 60 gallons per minute.

The depth to ground water in the Helena Valley area ranges from 10 to 400 feet. It is estimated that 150,000 acre-feet of good quality water is stored in the deep alluvium of the Helena Valley. Some artesian wells flow at rates of up to 125 gallons per minute, while maximum rates for pumped wells are as much as 1,000 gallons per minute.

Most stream valleys throughout the survey area have enough coarse alluvium to produce adequate quantities of water for domestic use. Areas underlain by hard rock will commonly produce enough water for both domestic and livestock use since deformation by folding and faulting have created fracture pockets that retain water. A small amount of poor quality water is available in areas that are underlain by Cretaceous shales and mudstones.

Physiography, Drainage, and Geology

Clifford A. Balster, Geologist, prepared this section.

Most of the survey area lies in the Northern Rocky Mountain physiographic province. However, the far northeastern corner of the survey area is assigned to the Northern Great Plains Province. Between these two provinces is an area known as the Disturbed Belt. A transition area of foothills, it is characterized by complex folding and faulting related to the Rocky Mountain deformation. In reality, it is a separate physiographic province but is traditionally included in the Northern Rocky Mountain Province.

The Continental Divide defines several miles of the survey area's boundary and then trends northwestward. The survey area boundary again follows the Continental Divide, northward from Twin Peaks, to the northern end of the county. Mountainous terrain is characteristic of both sides of the Continental Divide.

Not included in this soil survey were most of the Rocky Mountains that are located north of Silver King and Red Mountains. Nearly all of the Big Belt Mountains were also excluded. However, wherever discussion of topography and drainage can be enhanced by including descriptions of these areas, they will be briefly described.

Except for the northeastern corner, most of the survey area is mountainous. West of the Missouri River, numerous linear mountain ranges were formed when large fault blocks were thrust upward and eastward from the west and over other blocks. Where these fault blocks dip steeply westward and are comparatively thin, the ranges are narrow and

separated by equally narrow intervening valleys. Many of these ranges have steep, eastern slopes and gentler, western slopes. Where fault blocks are thicker, or the westward dip is smoother, the ranges are wider and less linear. Narrow linear mountain ranges are more typical of the northern part of the survey area while broader ranges generally occur in the southern part. East of the Missouri River, very broad thrust blocks and poorly defined ranges characterize the Big Belt Mountains.

Narrow ranges of hills and intervening valleys characterize the Disturbed Belt, which borders the mountains on the northeast. Most of the hills and valleys have a northwestern-southeastern trend. Because of erosion factors, they are much more subdued than mountains to the west.

Northeast of the Disturbed Belt, buttes, mesas, and rolling hills are characteristic topography. The boundary between the Northern Great Plains and the Disturbed Belt lies along a southeastward-trending line through the Willow Creek Reservoir and Augusta.

Since the survey area straddles the Continental Divide, drainage flows toward both the Pacific Ocean and the Gulf of Mexico. The Missouri River and its tributaries drain the largest section of the survey area. Of the Columbia River system, both the Blackfoot and South Fork of the Flathead Rivers and tributaries are on the west side of the Continental Divide and carry waters westward to the Pacific Ocean. Each of these major drainages will be discussed later.

Several dams in the survey area impound waters of the Missouri River. Holter Dam forms Holter Lake; Hauser Dam impounds waters of Hauser Lake and Lake Helena; and Canyon Ferry Dam results in Canyon Ferry Lake. These lakes occupy many miles of the Missouri River's relatively narrow valley floor.

Canyon Ferry Lake, at the bottom of the Missouri River valley, enters the survey area in the southeastern corner. Below Canyon Ferry Dam, the Missouri River flows through a narrow canyon which, in places, is up to 500-feet deep. The valley widens as it exits the Spokane Hills. Near Lakeside for a short distance, the valley is broad with low relief but again becomes narrow and canyon-like within a mile below Lakeside. Just below the mouth of Trout Creek, mountains rise about 900 feet above water level. The valley widens briefly near Eldorado Bar but again becomes a canyon, about 1,000-feet deep, until it widens at Upper Holter Lake. The surrounding hills are about 100-feet high at the lower end of Upper Holter Lake, forming the well-known "Gates of the Mountains." The canyon gradually broadens downstream but never becomes a wide river valley with extensive flood plains and terraces until after it leaves the survey area.

Trout, Beaver, Elkhorn, Cottonwood, Wegner, and Stickney Creeks all head in the Big Belt Mountains. These creeks are small tributaries of the Missouri River and join the river from the east.

The Sun River and its tributaries drain most of the northern part of the survey area. The Sun River marks the northern boundary of the survey area and empties into the Missouri River in Cascade County at Great Falls. Fool and Open Creeks join the North Fork of the Sun River in the northern tip of the survey area. Lick, Gates, Rock, and Moose Creeks are major tributaries from the west. They flow into the North Fork of the Sun River as it flows southward along the survey line. The Sun River and the South Fork of the Sun River and its tributaries drain many square miles of mountainous terrain before joining the North Fork of the Sun River about a mile above Gibson Reservoir. Major tributaries of the South Fork of the Sun River are the West Fork of the Sun River and Straight and Wood Creeks. Dry, Elk, and Willow Creeks also join the Sun River before it leaves the survey area.

Scapegoat Mountain is a prominent feature on the Continental Divide. On its north side, a narrow divide separates drainage waters of Straight Creek, which flows northward to the Sun River, from the Dearborn River, which flows eastward for a few miles, then southeastward between Grassy Hills and Steamboat Mountain in a well-defined valley. The Dearborn River again changes course to flow eastward and northeastward before leaving the mountains near Bean Lake. After leaving the mountains, it flows generally southeastward and joins the Missouri River in Section 19, Township 16 North, Range 2 West. Major tributaries of the Dearborn River are Falls and Flat Creeks and Middle and South Forks of the Dearborn River.

Several small tributaries of the Missouri River drain the survey area south of the Dearborn River system. Little Prickly Pear Creek drains a sizable area between the Dearborn River system and Prickly Pear Creek drainage. McClellan and Prickly Pear Creeks both flow into Lake Helena. Spokane Creek drains a small region in the southeastern corner.

West of the Continental Divide, the Blackfoot River and the South Fork of the Flathead River provide drainage. The South Fork of the Flathead River drains a small section in the western part of the survey area where Danaher Creek and its tributaries drain a small basin south of Sugarloaf Mountain. The Blackfoot River system drains the greater part of the survey area west of the Continental Divide.

Anaconda and Beartrap Creeks join in the northeastern corner of Section 28, Township 15 North, Range 6 West, and form the headwaters of the Blackfoot River. Major tributaries joining the Blackfoot River before it leaves the survey area are Cadotte, Humbug, Keep Cool, and Poorman Creeks and Landers Fork. The North Fork of the Blackfoot River drains a sizable area southwest of Scapegoat Mountain before leaving the survey area to join the Blackfoot River. Principal tributaries of the North Fork of the Blackfoot River are the Dry and East Forks.

Tributaries of the Little Blackfoot River drain a small area in Township 11 North, Ranges 6 and 7 West. Dog Creek and its tributaries drain almost all of this area, though Ophir Creek does flow from a small basin west of the Dog Creek drainage.

In general, streams of the survey area tend to follow geologically or structurally defined trends. They commonly cut across major trends, however, and in places seem entirely unrelated to any identifiable geologic feature.

The geology of lithified rocks in the survey area can be conveniently divided into five major provinces. Relatively flat-lying or gently folded rocks of Cretaceous age are mapped in the northeastern corner of the survey area. Thrust-faulted and complexly folded Cretaceous rocks of the Disturbed Belt border flat-lying sediments toward the southwest and are transitional to imbricated thrust sheets of the older rocks in mountain ranges. Imbricated thrust sheets are generally comprised of rocks from the Jurassic and Mississippian Ages and older, though some areas of Cretaceous sedimentary rocks and Tertiary-Cretaceous igneous rocks are mapped. Westward of the imbricate thrusts is a province of broadly folded rocks ranging in age from Precambrian to Mississippian. Faulting is present in this province but not as complex as the area of imbricate faulting. Normal faults are more common in the western province than in the overthrust belt. The Big Belt Mountains belong to the broadly folded and faulted province. Volcanic rocks, both intrusive and extrusive, comprise the fifth geologic province. Adel Volcanics of early-Tertiary age are extensive in the northern part of the Big Belt Mountains. Small outcrops of Tertiary intrusive rocks are mapped throughout the survey area, and some areas of Tertiary-Cretaceous intrusives are mapped in the imbricate thrust belt. Intrusive rocks of Precambrian age are mostly located in the province of broad folding, but some outcrops are mapped in imbricate thrust sheets.

Precambrian sedimentary rock types of the Belt Supergroup include argillite, quartzite, siltite, and some limestone. All Precambrian lithologies show the result of metamorphism and are remarkably resistant to erosion.

Other than the basal Flathead Sandstone, Cambrian rocks are almost entirely limestone and shale. Some dolomite is present, and many of the limestones are more or less dolomitic. Limestone of this sequence is generally somewhat resistant to erosion and forms ridges, but the shales typically erode to make valleys. Flathead Sandstone is the most resistant lithology of the Cambrian section.

Dolomite is the dominant lithology of the Devonian sequence, but some shale and mudstone occur in both the lower and upper units. Some evaporites are present at depth but generally do not persist at the outcrop. Dolomites of the Devonian sequence are expressed topographically as ridges. The shaly sections at the bottom and top of the sequence erode more readily and tend to form small valleys or covered areas at the outcrop.

Carbonate rocks of the Mississippian age range from shaly limestone and dolomite to massive, thick sections of limestone. Almost without exception, the Mississippian outcrops form prominent ridges or massive hills. Elongated ridges or walls of Mississippian carbonates are characteristic of imbricate thrust areas. Total thickness often exceeds 1,000 feet and produces the high relief generally associated with Mississippian terrain.

Jurassic rocks are mixtures of marine and nonmarine rocks that include shales, sandstones, mudstones, and some limestones. Rarely do any of the lithologies achieve sufficient thickness or resistance to erosion to form prominent ridges. Volcanic activity in the region produced some tuffaceous rocks in the Morrison Formation (youngest of the sequence).

Sedimentary rocks of Cretaceous age are mostly shales, mudstones, and sandstones, but some tuffaceous rocks occur south of Augusta. Most Cretaceous lithologies are not adequately erosion resistant to form high-relief topography, but steep slopes are not uncommon along the margins of the sandstone-capped mesas or buttes. Nonmarine conditions are recorded in early sediments of the Cretaceous age, but throughout the period, alternating marine and nonmarine rocks were deposited. By the end of Cretaceous time, nonmarine beds were dominant, and volcanic materials became more prominent in the lithologies.

Tertiary sedimentary rocks are not major constituents in the survey area. Very small areas of lake deposits of Oligocene and Miocene ages are mapped west of the Missouri River. An extensive area

of tuffaceous conglomerate, sandstone, siltstone, and shale of undesignated Tertiary age is mapped south of Lake Helena to the survey line. Some parts of the uppermost Cretaceous St. Mary River Formation are of Paleocene (lowest Tertiary) age, but the boundary between Cretaceous and Paleocene is obscure.

Pleistocene deposits include gravels on high-level terraces, lake deposits, glacial drift, and morainal materials. Some of the high-level gravels have been assigned a Pliocene age (late Tertiary) but most likely should be considered only as Pleistocene. All the Pleistocene materials are unconsolidated or poorly consolidated and are very difficult to separate from Holocene deposits. Only the most recent alluvial sediments can clearly be called Holocene age, as glaciation in the higher mountains continues to the present time.

Geologic structure in the survey area has been generally discussed with the description of geology because the relationship between the two is almost inseparable. A large linear syncline, known as the Continental Divide Syncline, is well named as it exposes resistant Precambrian rocks that form the backbone of the continent. This syncline is bordered on the east by a thrust fault. The block may have been thrust a long distance over underlying rocks, representing the westernmost thrust sheet of the survey area. Immediately east of the Continental Divide Syncline and its bounding fault, a series of closely spaced imbricate thrust sheets extend to the mountain front and into the Disturbed Belt. Resistant rocks of Mississippian age and older cause the mountains to stand in high relief. Nonresistant rocks of Cretaceous age form the more subdued topography of the Disturbed Belt. Southward from the Continental Divide Syncline, rocks are broadly folded and sparsely faulted, but their resistant character results in mountainous topography. Structure in the Big Belt Mountains fits most closely into the latter province, but broader and better-defined folds characterize it.

The Lewis and Clark County Area has produced mineral resources valued at over $40 million. About $6 million of this was gold produced from placer deposits. Major metallic resources were gold, silver, copper, lead, and zinc. Minor production of tungsten and arsenic has been reported. Indications supporting the occurrence of bismuth, tin, molybdenum, manganese, and antimony have also been reported. Production of nonmetallic resources has been limited to sapphires, present in placer deposits on the eastern side of the Missouri River Valley. Minor occurrences of barite and fluorite have been reported, but their significance is unknown.

Little interest in oil exploration has been shown except, in the late 1970s, in the northern part of the Disturbed Belt. This interest was short-lived and resulted in little activity. A disappointing deep test was drilled near Marysville in search of potential geothermal energy. The outlook for future exploration interest is unknown.

Baxendale, Peeler, and Woodgulch soils are restricted to the hills and mountainous areas in the southern part of the survey area. Granitic rocks of Cretaceous age provide parent material for these soils. Peeler soils formed in material derived from granitic rock. Baxendale and Woodgulch soils formed in residuum weathered from granitic rocks. All three soils have clay-enriched B horizons that reflect some degree of landscape stability for an extended period. No calcareous horizons are present in these soils.

Colluvium and alluvium from argillite, igneous, and limestone rocks provide parent material for the Helmville, Stemple, and Tigeron soils. Much of the mountainous terrain in the western part of the survey area is mantled by these soils. Helmville soils formed in colluvium and alluvium derived from limestone, argillite, and igneous rocks. Stemple and Tigeron soils formed in colluvium derived from argillite of the Belt Supergroup and from igneous rocks ranging in age from Precambrian to Tertiary. These two soils are typically located on strongly sloping to very steep slopes. All three soils have clay-enriched B horizons and occur on mountainous terrain. Perhaps high rates of infiltration and mobile clays contribute to the rapid translocation of materials while water moves through the soil.

Argillite, quartzite, and siltite of the Belt Supergroup, and fine-textured rocks of the Adel Volcanics (Tertiary), provide most of the parent material for Holter, Mocmont, and Tolex soils. Minor amounts of Cretaceous sedimentary rocks and Mississippian carbonates and shales crop out and additionally contribute to the parent material for these soils. Holter and Mocmont soils developed in colluvium derived from igneous bedrock and argillite of the Belt Supergroup. Some contribution is by fine-textured rocks of the Adel Volcanics. Tolex soils formed in material derived from Belt Supergroup argillite and igneous bedrock.

Castner, Holter, and Windham soils are in areas with mixed lithologies of bedrock providing the parent material. Castner soils developed in shallow residuum weathered from argillite, quartzite, and

sandstone. Colluviums derived from argillite and igneous bedrock are the parent material for the Holter soils. Windham soils formed in colluvium and alluvium derived from limestones of the Mississippian, Devonian, and Cambrian ages.

A small area of Crow and Mikesell soils is mapped in the mountains and foothills south of Lincoln. Tertiary shales, mudstones, and alpine till provide parent material for these soils. In addition, Belt Supergroup quartzite from nearby areas contributes a minor amount to the parent material.

The Worock and Yourame soils occur in the glaciated mountainous terrain near Lincoln. Worock soils developed in alpine till derived from Belt Supergroup rocks and rocks ranging in age from Tertiary to Precambrian. Yourame soils formed in alpine till in glaciated valleys of the survey area.

Farnuf, Hilger, and Silvercity soils are mapped near Lincoln. Alluvium and glacial till are the parent material for these soils. Farnuf soils are loamy textured. The Hilger and Silvercity soils are loamy textured with more than 35 percent coarse fragments of mostly igneous rock and quartzite.

Beanlake, Fairfield, and Winspect soils occur in the northwestern part of the survey area. Beanlake soils developed on extensive glacial moraines in loamy materials of mixed mineralogy. Fairfield soils formed on alluvial fans and moraines near the mountains from parent material with significant amounts of limestone. Parent material for Winspect soils is calcareous alpine till derived from limestone, dolomite, sandstone, and argillite from the mountains to the west. Limestone of Devonian and Mississippian ages, argillite of Precambrian age, and sandstone of Cretaceous age are major contributors to the lithologic assemblage of these tills. Glacial sediments on hills are the dominant parent material for all of these soils.

Delpoint and Marmarth soils are mapped in an area east of Augusta, underlain by the Horsethief, St. Mary River, and Two Medicine Formations of Cretaceous age. Sandstone is a subordinate lithology in this section but appears more prominently than expected because it is more resistant to erosion. Delpoint soils developed from sandstones and siltstones that were originally calcareous. Parent material for the Marmarth soils are sandstone, siltstone, and shale. Marmarth soils are on gently sloping to moderately steep slopes of sedimentary plains and hills and seems to reflect landscape stability because of clay-enriched B horizons.

Cretaceous rocks of the Horsethief, Marias, St. Mary River, Two Medicine, and Virgelle Formations provide parent material for the Cabba, Reeder, and Regent soils. As mentioned above, sandstone is a subordinate constituent of this sequence. Parts of the Two Medicine Formation also have abundant volcaniclastic materials, some of which are flows. Much of the area where these soils are located is complexly thrust-faulted and tightly folded. The shallow Cabba soils occur on a variety of slopes, some of them very steep, and are derived from weathered calcareous sandstones. Reeder soils formed from calcareous sandstones, mudstones, and siltstones. Typical landscapes are rolling hills of plains topography with slopes ranging from gently sloping to steep. Regent soils are weathered from shales and mudstones.

Assinniboine, Megonot, and Weingart soils developed in poorly consolidated sediments of Tertiary age or in alluvium derived from these materials. Assinniboine soils formed in alluvium derived from sandy shales and shaly sandstones of Tertiary age. Megonot soils developed in material derived from Tertiary shales and mudstones. Both Assinniboine and Megonot soils are mapped on landscapes ranging from gently sloping to steep. Weingart soils typically occur on gentle slopes on hills and sedimentary plains. These soils developed in material derived from Tertiary shales and mudstones.

Calcareous lake sediments of Pleistocene age are the parent material for Brocko and Chinook soils. These soils are mapped in small areas of dissected uplands that border the Missouri River near Wolf Creek. Originally, the topography was probably undulating; it has since been modified by dissection. Brocko soils formed from silty lacustrine sediments. Chinook soils are derived from sandy lake sediments. Neither of these parent material sediments is consolidated.

The Amesha, Musselshell, and Sappington soils formed in calcareous alluvium of probable Pleistocene age. Some poorly consolidated late-Tertiary sediments may be included in this survey area. Amesha soils developed in strongly calcareous alluvium deposited on nearly level to moderately sloping fans or pediments. Musselshell soils formed in alluvium with a strong component of limestone fragments. Calcareous alluviums containing fragments of igneous and metamorphic rocks are the parent material for the Sappington soils. Sappington landscapes are remnants of old pediments and are generally nearly level to moderately sloping.

The Crago, Geohrock, and Sieben soils are on upland remnants of alluvial fans, pediments, or terraces. Coarse alluvium is the parent material for these soils. Parent material for Crago soils are mostly

limestone fragments. Argillite is the dominant constituent of the alluvium that formed the Geohrock soils. Coarse fragments are a dominant part of the Sieben soils, comprised mostly of argillite and igneous rocks.

Near Augusta and Helena, gravels and sands of low terraces and associated alluvial fans are the parent material for Attewan, Binna, and Nippt soils. Attewan soils occupy positions ranging from nearly level to moderately sloping. These soils developed in alluvium containing 60 to 80 percent pebbles and cobbles. Nippt soils are nearly level to gently sloping and formed in alluvial gravels of argillite and igneous rocks. All three soils are calcareous and reflect the influence of limestone in the alluvium parent material.

The Fairway, Fluvaquents, and Silverking soils are mapped on low stream terraces and flood plains near Lincoln. These soils formed in alluvium, presumably of late-Pleistocene age. Fairway soils developed in finer-textured alluvium than the extremely gravelly Silverking soils. Fairway soils occupy slightly depressed areas on flood plains and drain somewhat poorly. The parent material for these soils may have been strongly influenced by glacial outwash.

The Korell, Rivra, and Ryell soils occur along flood plains and low terraces of major streams in the northeastern part of the survey area. The parent material are alluviums of Holocene or very late-Pleistocene age. Korell soils developed in silty phases of alluvium while Ryell soils formed in the sandy phases. Rivra soils are derived from extremely gravelly channel deposits. All of these soils are well drained.

Fairway, Meadowcreek, and Villy soils occur on flood plains throughout the survey area. The Fairway and Meadowcreek soils have sand, pebbles, and cobbles in the lower part of the profile. These soils are somewhat poorly drained to poorly drained. Villy soils formed in loamy alluvium.

Whenever soils are related to the geology of an area, it must be remembered that many materials were transported before they became parent material. Some materials were moved a short distance while others may have been moved miles. Apparent anomalous mineralogy, or rock content, is often evidence that materials were transported, even though other evidence may be obscure.

Climate

Precipitation in the survey area ranges mainly from 10 to 30 inches per year. Mean annual temperature ranges from 35 to 45 degrees F.

Summers in the survey area are generally quite pleasant with cool nights; moderately warm, sunny days; and very little hot or humid weather. Most summer rainfall occurs as showers or thunderstorms, but steady rains may occur during late spring or early summer. Most summers pass with the highest temperatures failing to reach 100 degrees F. During April and October, frost frequently occurs along the mountain fronts and in valleys. On rare occasions, frost may occur in low-lying areas at any time of the year.

Winters are not as cold as expected for continental locations at this latitude, largely because of Chinook winds for which the survey area is noted. While subzero weather is normally experienced several times during winter, the coldest weather seldom lasts more than a few days at a time. Cold temperatures cease when Chinook winds arrive from the southwest. They can produce sharp temperature rises of 40 degrees F or more in a 24-hour period. As a result of recurring Chinook winds throughout the winter season, snow seldom accumulates to any great depth. The ground is usually bare, or nearly bare, of snow during most of the winter, except in the mountain fronts and higher foothills. On the other hand, invasions of cold air from the polar regions occur a few times each winter. From mid-December to March, sharp temperature falls are observed, from above freezing to below zero, within a 24-hour period.

On the following pages are climate tables for the period 1961 to 1990 for the survey area. The "Temperature and Precipitation" table gives data for the survey area as recorded at Canyon Ferry Dam, Flatwillow, and Helena. The "Freeze Dates in Spring and Fall" table shows probable dates of the first freeze in fall and last freeze in spring. The "Growing Season" table provides data on probable length of the growing season.

Growing-degree days, as shown in the "Temperature and Precipitation" table, 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.

As is usual in areas having wide variations in elevation and irregular topographic features, differences in the amount of precipitation are considerable. Generally, precipitation falls as snow during late fall, winter, and early spring. Rain can occur in any month. Late spring, summer, and early

fall precipitation is almost always rain, but some hail is occasionally observed during summer thundershowers. The wettest areas are along the mountains.

Although the mean annual precipitation would normally classify the survey area as semiarid, it is important to note that about 70 percent of the annual total precipitation normally falls during the April to September growing season. Heavy fog seldom occurs with any frequency and is usually limited to about 1 day per month, with each incident remaining for only a small portion of the day. Although the average windspeed is relatively high, extremely strong winds of over 70 mph are seldom observed. Visibility is normally excellent.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. This 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 survey area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, soil scientists develop a concept, or model, of how the soils were formed. During mapping, this model enables 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, 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 data from these analyses and tests as well as field-observed characteristics and 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 for crop yields under high levels of management are modeled and validated with farm records and field or plot information 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, 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.

Descriptions, names, and delineations of the soils in this survey area may not fully agree with those of the soils in adjacent survey areas. Differences result from 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.

Temperature and Precipitation

(Recorded in the period 1961-1990 at Canyon Ferry Dam, Flatwillow, and Helena)

Month	Temperature (Degrees F)					Precipitation (Inches)					
	Average Daily Maximum	Average Daily Minimum	Average	2 years in 10 Will Have— Maximum Temperature More Than	2 years in 10 Will Have— Minimum Temperature Less Than	Average Number of Growing Degree Days*	Average	2 years in 10 Will Have— Less Than	2 years in 10 Will Have— More Than	Average Number of Days With 0.10 or More	Average Total Snowfall
CANYON FERRY DAM:											
January---	31.2	13.3	22.3	54	-24	4	0.54	0.16	0.84	1	0.5
February--	37.7	18.0	27.9	59	-17	10	0.33	0.10	0.52	1	0.0
March-----	46.0	24.0	35.0	67	-6	46	0.57	0.26	0.84	1	1.4
April-----	57.4	32.2	44.8	78	15	176	0.95	0.51	1.33	3	0.6
May-------	67.0	40.1	53.6	86	26	423	1.93	1.03	2.72	5	0.0
June------	76.0	47.9	61.9	93	34	657	1.93	0.94	2.79	5	0.0
July------	84.7	52.5	68.6	98	40	883	1.34	0.47	2.06	3	0.0
August----	83.8	51.5	67.6	98	38	855	1.30	0.57	2.00	3	0.0
September-	71.9	43.1	57.5	90	27	526	1.21	0.44	1.86	3	0.0
October---	59.8	35.2	47.5	80	15	257	0.66	0.20	1.08	2	0.0
November--	44.0	25.8	34.9	65	-1	51	0.48	0.25	0.69	1	0.2
December--	33.6	16.8	25.2	56	-19	10	0.55	0.26	0.80	1	1.2
Yearly:											
Average--	57.8	33.4	45.6	———	———	———	———	———	———	———	———
Extreme--	106.0	-36.0	———	99	-28	———	———	———	———	———	———
Total----	———	———	———	———	———	3,899	11.80	9.14	14.30	29	3.9
FLATWILLOW:											
January---	33.4	9.1	21.3	63	-30	16	0.56	0.18	0.87	1	7.5
February--	40.1	14.9	27.5	68	-21	25	0.34	0.10	0.57	0	4.2
March-----	47.4	21.6	34.5	74	-14	62	0.70	0.35	1.00	2	5.8
April-----	58.9	30.9	44.9	85	8	197	1.28	0.56	1.89	3	4.9
May-------	68.8	39.9	54.4	91	22	448	2.89	1.67	3.97	6	0.8
June------	78.4	48.4	63.4	98	34	697	2.36	1.17	3.39	5	0.0
July------	86.7	53.4	70.1	102	39	923	1.30	0.58	1.92	3	0.0
August----	85.6	51.4	68.5	102	37	881	1.27	0.52	1.97	2	0.0
September-	73.3	42.2	57.7	96	24	530	1.13	0.32	1.85	3	0.5
October---	63.1	33.7	48.4	87	10	295	0.85	0.27	1.33	2	2.1
November--	46.4	21.4	33.9	73	-11	62	0.43	0.14	0.67	1	4.4
December--	36.0	11.8	23.9	65	-29	19	0.50	0.18	0.77	1	6.9
Yearly:											
Average--	59.8	31.6	45.7	———	———	———	———	———	———	———	———
Extreme--	108.0	-41.0	———	103	-34	———	———	———	———	———	———
Total----	———	———	———	———	———	4,156	13.60	0.96	16.11	29	37.2

See footnote at end of table.

Temperature and Precipitation--Continued

Month	Temperature (Degrees F)					Precipitation (Inches)					
	Average Daily Maximum	Average Daily Minimum	Average	2 years in 10 Will Have— Maximum Temperature More Than	2 years in 10 Will Have— Minimum Temperature Less Than	Average Number of Growing Degree Days*	Average	2 years in 10 Will Have— Less Than	2 years in 10 Will Have— More Than	Average Number of Days With 0.10 or More	Average Total Snowfall
HELENA:											
January---	29.8	9.8	19.8	56	-27	5	0.63	0.21	0.98	1	8.9
February--	37.1	16.0	26.6	61	-19	11	0.42	0.16	0.63	1	5.7
March-----	44.9	22.4	33.6	70	-8	39	0.73	0.37	1.05	2	7.4
April-----	56.0	30.7	43.3	80	14	155	0.97	0.48	1.40	3	5.5
May-------	65.4	39.6	52.5	88	26	391	1.78	0.87	2.56	4	1.7
June------	74.8	47.8	61.3	95	34	638	1.87	0.85	2.75	5	0.1
July------	83.8	52.8	68.3	99	40	878	1.10	0.32	1.74	2	0.0
August----	82.0	51.0	66.5	99	38	822	1.29	0.42	2.01	3	0.0
September-	69.8	41.0	55.4	92	24	467	1.15	0.34	1.80	3	1.6
October---	58.6	31.6	45.1	80	10	201	0.60	0.14	0.96	1	2.2
November--	42.4	20.8	31.6	66	-8	29	0.48	0.22	0.70	1	4.8
December--	31.3	11.3	21.3	58	-28	7	0.59	0.27	0.86	1	8.5
Yearly:	———	———	———	———	———	———	———	———	———	———	———
Average--	56.3	31.2	43.8	———	———	———	———	———	———	———	———
Extreme--	105.0	-38.0	———	101	-32	———	———	———	———	———	———
Total----	———	———	———	———	———	3,644	11.61	8.99	14.08	27	46.3

* 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 (Threshold: 40.0 degrees F).

Freeze Dates in Spring and Fall

(Recorded in the period 1961-1990 at Flatwillow and Helena)

Probability	Temperature		
	24 Degrees F or Lower	28 Degrees F or Lower	32 Degrees F or Lower
FLATWILLOW:			
Last freezing temperature in spring: January-July			
1 year in 10 later than------	May 11	May 25	June 2
2 years in 10 later than-----	May 5	May 19	May 28
5 years in 10 later than-----	April 24	May 9	May 19
First freezing temperature in fall: August-December			
1 year in 10 earlier than----	September 23	September 11	September 6
2 years in 10 earlier than---	September 30	September 17	September 10
5 years in 10 earlier than---	October 12	September 28	September 19
HELENA:			
Last freezing temperature in spring: January-July			
1 year in 10 later than------	April 30	May 12	June 1
2 years in 10 later than-----	April 26	May 7	May 27
5 years in 10 later than-----	April 18	April 29	May 18
First freezing temperature in fall: August-December			
1 year in 10 earlier than----	September 21	September 13	September 5
2 years in 10 earlier than---	September 27	September 18	September 10
5 years in 10 earlier than---	October 8	September 30	September 20

Growing Season

(Recorded in the period 1961-1990 at Flatwillow and Helena)

Probability	Daily Minimum Temperature		
	Higher Than 24 Degrees F	Higher Than 28 Degrees F	Higher Than 32 Degrees F
	Days	*Days*	*Days*
FLATWILLOW:			
9 years in 10	146	118	101
8 years in 10	154	126	108
5 years in 10	170	141	122
2 years in 10	185	156	136
1 year in 10	193	164	144
HELENA:			
9 years in 10	148	131	105
8 years in 10	157	139	112
5 years in 10	172	153	124
2 years in 10	188	167	137
1 year in 10	196	174	143

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 tables, "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," at the end of this section show the classification and extent of the soils in this survey area.

Formation of the Soils

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

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

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

Climate

Temperature and precipitation mainly determine climate, an active force in the formation of soils. Soils form in rocks that have been broken into suitable materials by erosion and alternate freezing and thawing. Chemical reactions, such as solution and hydration, further break down this weathered material.

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

Living Organisms

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

Roots, rodents, and insects penetrate the soil and alter its structure. Microorganisms, chemicals in the soil, and insects change leaves, roots, and entire plants that remain in the surface layer to humus. Fungi and algae also contribute to the decomposition of bedrock. Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common rodents in the survey area are gopher and rabbit. Some of the fragments on the surface of terraces, and on many other areas, were dug up by burrowing rodents.

Vegetation in this survey area consists mainly of short and mid grasses, trees, and shrubs.

Topography

Topography, or relief, is determined by glaciation and mountain formation and by the age and resistance of geologic formations to erosion by wind and water. Topography influences soil development through its effect on drainage and runoff. On the eroded uplands of this survey area, runoff water has carved deep valleys with many branches into the original bedrock. This rugged relief contrasts sharply with the smooth low relief of alluvial fans, stream terraces, and the flood plains of river valleys.

Soils on steep slopes that have rapid runoff have many characteristics similar to those of soils formed in arid climates. Nearly level to moderately sloping soils have the characteristics typical for this survey area. Map units 861D and 161E provide good examples of this process. The shallow Castner soils are on the steeper backslopes, and the very deep Farnuf and Shawa soils are on the footslopes and toeslopes. The Castner soil has a thin A horizon and

bedrock at a depth of 10 to 20 inches. The Farnuf soil has a thick, dark A horizon and a well-developed B horizon. The Shawa soil has a very thick dark A horizon.

Parent Material

Soils in this survey area formed from a variety of parent materials. Some soils formed in alluvium that was derived from mixed sources. Other soils formed in material weathered from igneous rocks, limestone, sandstone, or shale. Soils, such as the Blaincreek series, that formed in material derived from igneous rocks are generally loamy and have a high content of rock fragments. Soils, such as the Windham series, that formed in material derived from limestone have a high lime content, as lime is the basic constituent of limestone. Soils, such as the Vebar series, that formed in material derived mainly from sandstone are sandy, as sand is the basic constituent of sandstone. Soils, such as the Regent series, that formed in material weathered from shale are clayey, as clay is the basic constituent of shale. Soils, such as the Havre series, that formed in mixed alluvium derived from sandstone and shale are loamy.

Time

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

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

Havre silt loam, 0 to 2 percent slopes, of the Entisol order, is a young soil on a flood plain adjacent to a stream. This soil contains little organic matter to form an A horizon and no clay accumulation. Little translocation has occurred to form Bt and Bk horizons.

Farnuf soils formed in parent material similar to, but much older than, that of the Havre soils. Farnuf soils formed in alluvium or glacial till, on alluvial fans, and on stream terraces. They are mature soils of the Mollisol order. They contain enough organic matter to have a moderately dark-colored A horizon. They have a distinct clay accumulation in a Bt2 horizon, and nearly all of the carbonates have been leached to a depth of about 19 inches.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1998 and 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The table, “Classification of the Soils,” shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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 Ustoll (*Ust,* meaning burnt, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; 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 Argiustoll (*Argi*, meaning having an argillic horizon or clay accumulation, plus *ustoll,* the suborder of the Mollisols that has a dry climate).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup 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 taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the

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

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, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy-skeletal, mixed, superactive, frigid Typic Argiustolls.

SERIES. The series consists of soils within a family that have horizons similar in arrangement in the profile, color, consistence, mineral and chemical composition, reaction, structure, and texture. An example is the Holter series. The soils in the Holter series are loamy-skeletal, mixed, superactive, frigid Typic Argiustolls.

Soil Series and Detailed Map Units

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

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (Soil Survey Division Staff, 1962). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff, 1999). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units delineated on the detailed soil maps in 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.

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

Most minor 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, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. 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 contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and, consequently, they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all of the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, 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, all of 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, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is

divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Yamacall silt loam is a phase of the Yamacall series.

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

This survey includes *complexes.* They consist 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. Yamacall-Attewan loams, 0 to 2 percent slopes, is an example.

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

The "Acreage and Proportionate Extent of the Soils" table 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. Many of the terms used in describing the soils or miscellaneous areas are defined in the "Glossary."

Amesha Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans, stream terraces, and sedimentary plains
Parent Material: Alluvium
Slope range: 1 to 8 percent
Elevation range: 3,500 to 4,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Aridic Calciustepts

Typical Pedon

Amesha silt loam, 1 to 3 percent slopes, in an area of cropland, 2,650 feet north and 2,630 feet west of the southeast corner of sec. 18, T. 10 N., R. 1 E.

Ap—0 to 7 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 5/3) moist; weak coarse angular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—7 to 25 inches; white (10YR 8/2) silt loam, pale brown (10YR 6/3) moist; weak coarse prismatic parting to weak coarse angular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 2 percent pebbles; continuous faint lime casts on undersides of pebbles; disseminated lime and common faint lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—25 to 40 inches; white (10YR 8/2) loam, pale brown (10YR 6/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; few very fine roots; many very fine tubular and interstitial pores; 2 percent pebbles; disseminated lime and few fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C—40 to 60 inches; white (10YR 8/2) fine sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; 2 percent pebbles; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the Bk horizon: 4 to 8 inches

Ap horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam or silt loam
Clay content: 15 to 25 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bk1 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6 to 8 dry; 5 or 6 moist
Chroma: 2 or 3
Texture: Loam, sandy loam, or silt loam
Clay content: 10 to 18 percent
Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent pebbles
Calcium carbonate equivalent: 15 to 30 percent
Reaction: pH 7.9 to 8.4

Bk2 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6 to 8 dry; 5 to 7 moist
Chroma: 2 or 3

Texture: Loam or sandy loam
Clay content: 10 to 18 percent
Content of rock fragments: 0 to 10 percent—0 to 5 percent cobbles; 0 to 5 percent pebbles
Calcium carbonate equivalent: 15 to 35 percent
Reaction: pH 7.9 to 8.4

C horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6 to 8 dry; 5 to 7 moist
Chroma: 2 or 3
Texture: Loam, sandy loam, or fine sandy loam
Clay content: 10 to 18 percent
Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles
Calcium carbonate equivalent: 10 to 25 percent
Reaction: pH 7.9 to 8.4

136B—Amesha silt loam, 1 to 3 percent slopes

Setting

Landform: Alluvial fans
Slope: 1 to 3 percent
Elevation: 3,500 to 4,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Amesha and similar soils: 90 percent

Minor Components
Thess and similar soils: 0 to 5 percent
Sappington and similar soils: 0 to 5 percent

Major Component Description

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

Management

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

Aridic Ustifluvents

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Variable
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 120 days

Taxonomic Class: Aridic Ustifluvents

Typical Pedon

Aridic Ustifluvents, 0 to 4 percent slopes, in an area of rangeland, 195 feet south and 200 feet east of the northwest corner of sec. 36, T. 10 N., R. 2 W.

A—0 to 5 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; neutral; clear smooth boundary.
C1—5 to 12 inches; grayish brown (10YR 5/2) gravelly sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, slightly sticky, nonplastic; common very fine roots; 25 percent pebbles; slightly alkaline; clear smooth boundary.
C2—12 to 18 inches; grayish brown (10YR 5/2) loam with thin strata of sandy loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; slightly alkaline; clear smooth boundary.
C3—18 to 25 inches; grayish brown (10YR 5/2) sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky, nonplastic; common very fine roots; common very fine tubular and interstitial pores; slightly alkaline; clear smooth boundary.
2C4—25 to 60 inches; grayish brown (10YR 5/2) extremely cobbly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, slightly sticky, nonplastic; common very fine roots to 30 inches and few below; 30 percent cobbles and 35 percent pebbles; slightly alkaline.

Range in Characteristics

A horizon
Texture: Loam, clay loam, or sandy loam
Content of rock fragments: 10 to 35 percent pebbles

C horizon to a depth of 20 inches:
Texture: Loam, clay loam, or sandy loam
Content of rock fragments: 15 to 35 percent pebbles

C horizon below a depth of 20 inches:
Texture: Loam, sandy loam, or loamy sand
Content of rock fragments: 0 to 70 percent pebbles

1B—Aridic Ustifluvents, 0 to 4 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 4 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 120 days

Composition

Major Components
Aridic Ustifluvents and similar soils: 90 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 4 percent
Soils with sand and gravel at 20 inches: 0 to 4 percent
Somewhat poorly drained soils: 0 to 2 percent

Major Component Description

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

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

Management

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

Ashlo Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 30 inches and rapid below
Landform: Stream terraces and alluvial fans
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid Aridic Calciustolls

Typical Pedon

Ashlo very cobbly loam, in an area of Binna-Ashlo complex, 0 to 2 percent slopes, in an area of rangeland, 1,300 feet north and 2,200 feet west of the southeast corner of sec. 21, T. 20 N., R. 6 W.

A1—0 to 3 inches; grayish brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 20 percent cobbles and 20 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

A2—3 to 6 inches; brown (10YR 5/3) cobbly loam, dark brown (10YR 3/3) moist; moderate medium prismatic parting to moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; many faint very dark grayish brown (10YR 3/2) moist organic coats peds; 20 percent cobbles and 15 percent pebbles; continuous faint lime casts on undersides of rock fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—6 to 10 inches; very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 10 percent cobbles and 20 percent pebbles; continuous prominent lime casts on undersides of rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—10 to 20 inches; white (10YR 8/2) extremely gravelly loam, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular and interstitial pores; 10 percent cobbles and 60 percent pebbles; common rock- and cobble-size masses of petrocalcic material;

thick casts and pendants of cemented sand on undersides of cobbles and pebbles; many prominent lime coats on rock fragments; common fine soft masses of lime between fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—20 to 30 inches; very pale brown (10YR 8/3) extremely gravelly sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular and interstitial pores; 10 percent cobbles and 65 percent pebbles; common rock- and cobble-size masses of petrocalcic material; continuous prominent casts and pendants of cemented sand on undersides of cobbles and pebbles; many prominent lime coats on rock fragments; common fine soft masses of lime between fragments; violently effervescent; moderately alkaline; clear smooth boundary.

2C—30 to 60 inches; pale brown (10YR 6/3) extremely gravelly sand, dark brown (10YR 4/3) moist; single grain; loose; 10 percent cobbles and 65 percent pebbles; few cobble-size masses of petrocalcic material; continuous prominent lime casts and pendants of cemented sand and fine pebbles on undersides of larger rock fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 10 inches
Depth to the partially cemented Bk horizon: 10 to 20 inches
Depth to the sandy-skeletal 2C horizon: 20 to 40 inches

A1 horizon
- Value: 4 or 5 dry
- Chroma: 1 to 3
- Clay content: 15 to 25 percent
- Content of rock fragments: 35 to 60 percent—15 to 20 percent stones and cobbles; 20 to 40 percent pebbles
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 7.4 to 8.4

A2 horizon
- Value: 4 or 5 dry; 3 or 4 moist
- Clay content: 15 to 25 percent
- Content of rock fragments: 20 to 70 percent—10 to 30 percent stones and cobbles; 10 to 40 percent pebbles
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 7.4 to 8.4

Bk1 horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 7 to 8 dry; 5 or 6 moist
- Chroma: 2 to 4
- Clay content: 10 to 18 percent
- Content of rock fragments: 30 to 70 percent—10 to 15 percent stones and cobbles; 20 to 55 percent pebbles
- Calcium carbonate equivalent: 15 to 35 percent
- Reaction: pH 7.9 to 8.4

Bk2 and Bk3 horizons
- Hue: 10YR, 2.5Y, or 5Y
- Value: 8 dry; 6 or 7 moist
- Chroma: 2 or 3
- Texture: Loam or sandy loam
- Clay content: 10 to 20 percent
- Content of rock fragments: 60 to 80 percent (includes rock- and cobble-size petrocalcic material)—5 to 20 percent stones and cobbles; 50 to 65 percent pebbles
- Calcium carbonate equivalent: 40 to 60 percent
- Reaction: pH 7.9 to 8.4

2C horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 6 or 7 dry; 4 or 5 moist
- Chroma: 2 or 3
- Texture: Sand or loamy sand
- Clay content: 0 to 10 percent
- Content of rock fragments: 60 to 80 percent (includes cobble-size petrocalcic material)—10 to 20 percent stones and cobbles; 50 to 65 percent pebbles
- Calcium carbonate equivalent: 40 to 60 percent
- Reaction: pH 7.9 to 8.4

Assinniboine Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans and sedimentary plains
Parent material: Alluvium
Slope range: 2 to 8 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Argiustolls

Typical Pedon

Assinniboine sandy loam, in an area of Assinniboine-Chinook sandy loams, 2 to 8 percent slopes, in an area of cropland, 1,500 feet south and 1,800 feet west of the northeast corner of sec. 36, T. 11 N., R. 4 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; neutral; abrupt smooth boundary.

Bt1—5 to 9 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct very dark grayish brown (10YR 3/2) moist, clay films on peds and bridging sand grains; neutral; clear smooth boundary.

Bt2—9 to 14 inches; pale brown (10YR 6/3) sandy clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; common distinct clay films on peds and bridging sand grains; slightly alkaline; gradual smooth boundary.

Bk1—14 to 36 inches; white (10YR 8/2) sandy loam, pale brown (10YR 6/3) moist; weak coarse angular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; many distinct lime coats on faces of peds; many medium irregular soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—36 to 50 inches; light gray (10YR 7/2) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; 10 percent pebbles; disseminated lime and common fine irregular soft masses of lime; many distinct lime coats on pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

BC—50 to 60 inches; light gray (10YR 7/2) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; 10 percent pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 43 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches; may include all or part of the Bt horizons
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 horizons
- 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 30 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 6.6 to 7.8

Bk horizons
- 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

BC horizon
- 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, fine sand, or stratifications of these textures
- Clay content: 0 to 15 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 7.4 to 8.4

238B—Assinniboine-Chinook sandy loams, 2 to 8 percent slopes

Setting

Landform:
- Assinniboine—Alluvial fans
- Chinook—Alluvial fans

Slope:
- Assinniboine—2 to 8 percent
- Chinook—2 to 8 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Assinniboine and similar soils: 45 percent
Chinook and similar soils: 40 percent

Minor Components
Amesha and similar soils: 0 to 5 percent
Soils with very gravelly surface layers: 0 to 5 percent
Soils with sand and gravel at 30 inches: 0 to 5 percent

Major Component Description

Assinniboine
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 8.3 inches

Chinook
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 7.2 inches

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

Management

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

Attewan Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 23 inches and rapid below
Landform: Stream terraces and alluvial fans
Parent material: Alluvium
Slope range: 0 to 8 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy over sandy or sandy skeletal, mixed, superactive, frigid Aridic Argiustolls

Typical Pedon

Attewan loam, 0 to 2 percent slopes, in an area of cropland, 50 feet north and 750 feet west of the southeast corner of sec. 18, T. 10 N., R. 2 W.

Ap—0 to 5 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky parting to weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; slightly acid; abrupt smooth boundary.

Bt—5 to 10 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular pores; many distinct clay films on faces of peds; 5 percent pebbles; neutral; gradual smooth boundary.

Bk1—10 to 18 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular pores; 12 percent pebbles; disseminated lime; continuous faint lime casts on undersides of rock fragments; violently effervescent; slightly alkaline; clear smooth boundary.

Bk2—18 to 23 inches; brownish yellow (10YR 6/6) very gravelly loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots in lower part and common very fine roots in upper part; 45 percent pebbles; continuous faint lime casts on undersides of pebbles; violently effervescent; slightly alkaline; clear smooth boundary.

2C—23 to 60 inches; light yellowish brown (10YR 6/4) extremely gravelly sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky, nonplastic; 15 percent cobbles and 50 percent pebbles; continuous faint lime casts on undersides of coarse rock fragments in upper few inches; slightly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Thickness of the mollic epipedon: 7 to 12 inches; may include all or part of the argillic horizon
Depth to the Bk horizon: 10 to 21 inches
Depth to the 2C horizon: 20 to 40 inches

Ap horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
Reaction: pH 6.1 to 7.8

Bt horizon
Hue: 10YR or 2.5Y
Value: 4 to 6 dry; 3 or 4 moist
Chroma: 2 or 3
Texture: Clay loam, sandy clay loam, or loam
Clay content: 20 to 35 percent
Content of rock fragments: 0 to 25 percent—0 to 5 percent greater than 3-inch stones and cobbles; 0 to 20 percent less than 3-inch pebbles
Reaction: pH 6.6 to 7.8

Bk horizons
Hue: 10YR or 2.5Y
Value: 5 to 8 dry; 4 to 6 moist
Chroma: 2 to 4 or 6
Texture: Loam, clay loam, silt loam, sandy clay loam, or sandy loam
Clay content: 15 to 30 percent
Content of rock fragments: 0 to 30 percent—0 to 5 percent stones and cobbles; 0 to 25 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

2C horizon
Hue: 2.5Y or 10YR
Value: 4 to 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loamy sand, sand, loamy coarse sand, or coarse sand
Clay content: 0 to 10 percent
Content of rock fragments: 35 to 75 percent—0 to 15 percent stones and cobbles; 35 to 60 percent pebbles
Calcium carbonate equivalent: 2 to 10 percent
Reaction: pH 7.4 to 8.4

413A—Attewan loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Attewan and similar soils: 90 percent

Minor Components
Beaverell and similar soils: 0 to 4 percent
Nippt and similar soils: 0 to 3 percent
Thess and similar soils: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

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

Management

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

513A—Attewan-Nippt complex, 0 to 2 percent slopes

Setting

Landform:
- Attewan—Stream terraces
- Nippt—Stream terraces

Slope:
- Attewan—0 to 2 percent
- Nippt—0 to 2 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Attewan and similar soils: 60 percent
Nippt and similar soils: 30 percent

Minor Components
Nippt very cobbly loam surface: 0 to 5 percent
Nippt very gravelly loams: 0 to 5 percent

Major Component Description

Attewan
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 4.4 inches

Nippt
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 2.1 inches

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

Management

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

Auchard Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Sedimentary plains
Parent material: Material derived from shale and mudstone
Slope range: 2 to 8 percent
Elevation range: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Fine, mixed, superactive, frigid Typic Natrustalfs

Typical Pedon

Auchard loam, in an area of Regent-Auchard loams, 2 to 8 percent slopes, in an area of rangeland, 100 feet north and 300 feet east of the southwest corner of sec. 36, T. 19 N., R. 5 W.

E—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate very thin platy structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; many light gray (10YR 7/2) silt and sand skeletans on faces of peds; neutral; abrupt smooth boundary.

Btn—3 to 9 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; strong medium columnar structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular pores; continuous distinct very dark grayish brown (10YR 3/2) moist clay films on faces of peds; silt and sand skeletans on tops of columns; moderately alkaline; clear smooth boundary.

Btkn—9 to 24 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; few fine seams and soft masses of lime; continuous faint lime coats on faces of peds; strongly effervescent; strongly alkaline; gradual smooth boundary.

By—24 to 33 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; weak medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine tubular and interstitial pores; common fine seams and masses of gypsum; disseminated lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

Cr—33 to 60 inches; gray (5Y 6/1) semiconsolidated shale, gray (5Y 5/1) moist; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Btkn horizon: 5 to 15 inches
Depth to the Cr horizon: 20 to 40 inches

E horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 20 to 27 percent

Content of rock fragments: 0 to 10 percent pebbles
Reaction: pH 6.1 to 7.3

Btn horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 moist
Chroma: 2 or 3
Texture: Clay or silty clay
Clay content: 40 to 50 percent
Sodium adsorption ratio: 13 to 30
Reaction: pH 7.9 to 8.4

Btkn horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Silty clay loam, silty clay, or clay
Clay content: 35 to 50 percent
Electrical conductivity: 2 to 4 mmhos/cm
Sodium adsorption ratio: 13 to 30
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

By horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 moist
Chroma: 2 or 3
Texture: Silty clay loam, clay loam, or silty clay
Clay content: 30 to 45 percent
Electrical conductivity: 4 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 30
Calcium carbonate equivalent: 5 to 15 percent
Gypsum content: 1 to 3 percent
Reaction: pH 7.9 to 9.0

Baxendale Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid to a depth of 22 inches and rapid below
Landform: Hills
Parent material: Material weathered from granitic rock
Slope range: 4 to 15 percent
Elevation range: 4,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Baxendale sandy loam, in an area of Baxendale-Castner sandy loams, 4 to 15 percent slopes, in an area of rangeland, 1,800 feet north and 2,500 feet west of the southeast corner of sec. 33, T. 10 N., R. 5 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) sandy loam, very dark gray (10YR 3/1) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; slightly acid; clear smooth boundary.
A2—5 to 9 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic parting to moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; slightly acid; clear smooth boundary.
Bt1—9 to 14 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; moderate medium prismatic parting to moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; common faint yellowish brown (10YR 5/6) clay films on faces of peds and clay bridging of sand grains; neutral; gradual wavy boundary.
Bt2—14 to 22 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic parting to weak medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular and interstitial pores; common reddish yellow (7.5YR 6/6) coats on faces of peds and clay bridging of sand grains; neutral; gradual wavy boundary.
C—22 to 60 inches; light brownish gray (2.5Y 6/2) gravelly coarse sand, dark grayish brown (2.5Y 4/2) moist; massive; nonsticky nonplastic; few very fine roots in upper part; 15 percent angular pebbles; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 8 to 15 inches
Depth to the gravelly coarse sand C horizon: 20 to 30 inches

A horizons
Hue: 7.5YR, 10YR, or 2.5Y
Value: 4 or 5 dry; 3 moist
Chroma: 1 or 2
Clay content: 10 to 18 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
Reaction: pH 6.1 to 7.3

Bt horizons
Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4 or 6
Clay content: 12 to 18 percent
Content of rock fragments: 0 to 15 percent angular pebbles
Reaction: pH 6.6 to 7.8

C horizon
Hue: 7.5YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Coarse sand or loamy coarse sand
Clay content: 0 to 5 percent
Content of rock fragments: 0 to 35 percent angular pebbles
Reaction: pH 6.1 to 7.8

761C—Baxendale-Castner complex, 4 to 15 percent slopes

Setting

Landform:
- Baxendale—Hills
- Castner—Hills

Position on landform:
- Baxendale—Backslopes and footslopes
- Castner—Backslopes and shoulders

Slope:
- Baxendale—4 to 15 percent
- Castner—4 to 15 percent

Elevation: 4,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Baxendale and similar soils: 70 percent
Castner and similar soils: 20 percent

Minor Components
Soils that have slopes more than 15 percent: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent

Major Component Description

Baxendale
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 4.3 inches

Castner
Surface layer texture: Gravelly sandy loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.4 inches

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

Management

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

Beanlake Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Moraines
Parent material: Alpine till
Slope range: 2 to 25 percent
Elevation range: 3,800 to 5,500 feet
Mean annual precipitation: 12 to 19 inches
Frost-free period: 90 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Calciustolls

Typical Pedon

Beanlake stony loam, in an area of Beanlake-Winspect stony loams, 4 to 25 percent slopes, in an area of rangeland, 2,500 feet north and 2,200 feet east of the southwest corner of sec. 19, T. 20 N., R. 7 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 5 percent stones and 10 percent pebbles; slightly alkaline; clear smooth boundary.

Bk—6 to 16 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial

pores; 5 percent cobbles and 5 percent pebbles; disseminated lime; continuous faint lime casts on undersides of rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

Bky1—16 to 38 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent cobbles; disseminated lime; continuous faint lime casts on undersides of rock fragments; common fine seams of gypsum; violently effervescent; moderately alkaline; gradual smooth boundary.

Bky2—38 to 60 inches; light gray (2.5Y 7/2) cobbly loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; few very fine roots; common very fine tubular and interstitial pores; 20 percent cobbles and 15 percent pebbles; disseminated lime; continuous faint lime casts on undersides of rock fragments; common fine seams and masses of gypsum; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 8 inches

A horizon
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 1 or 2
Clay content: 15 to 25 percent
Content of rock fragments: 15 to 30 percent—5 to 15 percent stones and cobbles; 10 to 15 percent pebbles
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR
Value: 5 to 8 dry; 3 to 6 moist
Chroma: 2 or 3
Clay content: 18 to 25 percent
Calcium carbonate equivalent: 15 to 25 percent
Content of rock fragments: 10 to 35 percent—0 to 20 percent stones and cobbles; 5 to 15 percent pebbles
Reaction: pH 7.9 to 8.4

Bky1 horizon
Hue: 10YR or 2.5Y
Value: 7 or 8 dry; 5 or 6 moist
Chroma: 2 or 3
Clay content: 18 to 25 percent
Electrical conductivity: 2 to 4 mmhos/cm
Calcium carbonate equivalent: 15 to 25 percent
Gypsum content: 1 to 3 percent
Content of rock fragments: 10 to 35 percent—0 to 20 percent stones and cobbles; 5 to 15 percent pebbles
Reaction: pH 7.9 to 9.0

Bky2 horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 18 to 25 percent
Electrical conductivity: 2 to 4 mmhos/cm
Gypsum content: 1 to 3 percent
Calcium carbonate equivalent: 8 to 15 percent
Content of rock fragments: 15 to 40 percent—0 to 5 percent stones; 10 to 20 percent cobbles; 5 to 15 percent pebbles
Reaction: pH 7.9 to 9.0
Other features: Moist bulk density of more than 1.6 grams per cubic centimeter

343D—Beanlake-Winspect stony loams, dry, 2 to 25 percent slopes

Setting

Landform:
- Beanlake—Moraines
- Winspect—Moraines

Position on landform:
- Beanlake—Backslopes and footslopes
- Winspect—Backslopes and shoulders

Slope:
- Beanlake—2 to 25 percent
- Winspect—2 to 25 percent

Elevation: 3,800 to 4,300 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Beanlake and similar soils: 65 percent
Winspect and similar soils: 30 percent

Minor Components
Soils that are poorly drained and ponded: 0 to 2 percent
Delpoint and similar soils: 0 to 1 percent
Soils with loam surface layers: 0 to 1 percent
Soils that are deeper to lime: 0 to 1 percent

Major Component Description

Beanlake
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches

Winspect
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
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.

Management

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

543D—Beanlake-Winspect stony loams, 4 to 25 percent slopes

Setting

Landform:
- Beanlake—Moraines
- Winspect—Moraines

Position on landform:
- Beanlake—Backslopes and footslopes
- Winspect—Backslopes and shoulders

Slope:
- Beanlake—4 to 25 percent
- Winspect—4 to 25 percent

Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Beanlake and similar soils: 65 percent
Winspect and similar soils: 30 percent

Minor Components
Fairfield and similar soils: 0 to 2 percent
Soils that are poorly drained and ponded: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Beanlake
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches

Winspect
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
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.

Management

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

Beartooth Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium from limestone and argillite rock
Slope range: 25 to 60 percent
Elevation range: 4,600 to 5,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Beartooth loam, in an area of Beartooth-Whitecow, cool-Warneke cool complex, 25 to 60 percent slopes, in an area of forestland, 1,500 feet north and 20 feet

east of the southwest corner of sec. 15, T. 14 N., R. 2 W.

Oi—2 inches to 0; forest litter of slightly decomposed needles and twigs.
A—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine granular structure; soft, friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; neutral; clear smooth boundary.
Bt—7 to 16 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic parting to moderate medium and coarse subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; common distinct dark brown (10YR 3/2) moist, clay films on faces of peds; 10 percent angular pebbles; slightly alkaline; clear smooth boundary.
Bk1—16 to 37 inches; light gray (10YR 7/2) very gravelly loam, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium and coarse roots; many very fine tubular and interstitial pores; 10 percent angular cobbles and 35 percent angular pebbles; disseminated lime; continuous distinct lime casts on undersides of pebbles; many fine seams, threads and soft masses of lime; moderately alkaline; gradual smooth boundary.
Bk2—37 to 60 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; few very fine, fine, and medium roots; common very fine tubular and interstitial pores; 10 percent angular cobbles and 35 percent angular pebbles; continuous distinct lime casts on undersides of pebbles; many fine seams, threads and soft masses of lime; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 45 degrees F
Depth to the Bk horizon: 12 to 30 inches

A horizon
Value: 4 or 5 dry; 2 or 3 moist
Clay content: 15 to 25 percent
Rock fragments: 0 to 10 percent—0 to 5 percent angular cobbles; 0 to 5 percent angular pebbles
Reaction: pH 6.6 to 7.8

Bt horizon
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or silty clay loam
Clay content: 25 to 35 percent
Rock fragments: 10 to 35 percent—0 to 5 percent angular cobbles; 10 to 30 percent angular pebbles
Reaction: pH 6.6 to 7.8

Bk horizons
Hue: 10YR or 2.5Y
Value: 6 to 8 dry; 5 or 6 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Rock fragments: 35 to 60 percent—5 to 15 percent angular cobbles; 30 to 45 percent angular pebbles
Calcium carbonate equivalent: 25 to 35 percent
Reaction: pH 7.9 to 8.4

884F—Beartooth-Whitecow, cool-Warneke, cool complex, 25 to 60 percent slopes

Setting

Landform:
- Beartooth—Mountains
- Whitecow—Mountains
- Warneke—Mountains

Position on landform:
- Beartooth—Backslopes and footslopes
- Whitecow—Backslopes and footslopes
- Warneke—Backslopes and shoulders

Slope:
- Beartooth—25 to 60 percent
- Whitecow—25 to 60 percent
- Warneke—25 to 60 percent

Elevation: 4,600 to 5,200 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Beartooth and similar soils: 45 percent
Whitecow and similar soils: 35 percent
Warneke and similar soils: 15 percent

Minor Components
Soils with shale at 40 inches: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent

Major Component Description

Beartooth
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.7 inches

Whitecow
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.9 inches

Warneke
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.0 inches

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

Management

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

Beaverell Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 19 inches and rapid below
Landform: Stream terraces and alluvial fans
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy-skeletal over sandy or sandy-skeletal, mixed, superactive, frigid Aridic Argiustolls

Typical Pedon

Beaverell very gravelly loam, 0 to 2 percent slopes, in an area of rangeland, 1,200 feet south and 1,000 feet east of the northwest corner of sec. 30, T. 20 N., R. 6 W.

A—0 to 3 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 5 percent cobbles and 25 percent pebbles; slightly alkaline; clear smooth boundary.

Bt—3 to 7 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 3/3) moist; moderate very fine and fine subangular blocky structure; hard, friable, moderately sticky, moderately plastic; many very fine roots; many very fine tubular and interstitial pores; many distinct very dark grayish brown (10YR 3/2) clay films on faces of peds; 15 percent cobbles and 40 percent pebbles; neutral; clear smooth boundary.

Btk—7 to 11 inches; pale brown (10YR 6/3) extremely gravelly loam, dark brown (10YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; 5 percent cobbles and 60 percent pebbles; continuous distinct lime casts on undersides of rock fragments; common fine seams and soft masses of lime; strongly effervescent; slightly alkaline; gradual smooth boundary.

2Bk1—11 to 19 inches; light gray (10YR 7/2) extremely gravelly loamy sand, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots; common very fine tubular and interstitial pores; 10 percent cobbles and 60 percent pebbles; continuous distinct lime casts on undersides of rock fragments; weak cementation of pebbles; sand grains on undersides of larger rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

2Bk2—19 to 60 inches; pinkish gray (7.5YR 6/2) extremely gravelly sand, dark brown (7.5YR 4/2)

moist; single grain; nonsticky nonplastic; 20 percent cobbles and 50 percent pebbles; continuous distinct lime casts on undersides of rock fragments; weak cementation of pebbles; sand grains on undersides of larger rock fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Thickness of the mollic epipedon: 7 to 14 inches; may include all or part of the argillic horizon
Depth to the Bk horizon: 10 to 20 inches

A horizon
Value: 2 or 3 moist
Chroma: 2 or 3
Texture: Loam (very gravelly loam when mixed to 7 inches)
Clay content: 10 to 27 percent
Content of rock fragments: 15 to 60 percent—5 to 20 percent cobbles; 10 to 40 percent pebbles
Reaction: pH 6.6 to 7.8

Bt horizon
Hue: 10YR or 7.5YR
Value: 3 to 5 dry; 2 to 4 moist
Chroma: 2 to 4
Texture: Clay loam, sandy clay loam, or loam
Clay content: 20 to 35 percent
Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent pebbles
Reaction: pH 6.6 to 7.8

Btk horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 3 to 6 dry; 2 to 4 moist
Chroma: 2 to 4 or 6
Texture: Clay loam, sandy clay loam, or loam
Clay content: 20 to 35 percent
Content of rock fragments: 35 to 60 percent—0 to 15 percent cobbles; 35 to 45 percent pebbles
Reaction: pH 6.6 to 7.8

2Bk1 horizon
Hue: 10YR or 2.5Y
Value: 5 to 8 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loamy sand, sand, or sandy loam
Clay content: 0 to 15 percent
Content of rock fragments: 35 to 75 percent—5 to 30 percent cobbles; 30 to 45 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

2Bk2 horizon
Hue: 5YR, 10YR, or 2.5Y
Value: 4 to 6 dry; 4 to 6 moist
Chroma: 2 to 4 or 6
Texture: Loamy sand or sand
Clay content: 0 to 5 percent
Content of rock fragments: 35 to 80 percent—5 to 30 percent stones and cobbles; 30 to 60 percent pebbles
Calcium carbonate equivalent: 2 to 10 percent
Reaction: pH 7.4 to 8.4

465A—Beaverell-Ashlo very cobbly loams, 0 to 2 percent slopes

Setting

Landform:
- Beaverell—Stream terraces
- Ashlo—Stream terraces

Slope:
- Beaverell—0 to 2 percent
- Ashlo—0 to 2 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Beaverell and similar soils: 55 percent
Ashlo and similar soils: 30 percent

Minor Components
Rothiemay and similar soils: 0 to 10 percent
Soils with extremely cobbly loam surfaces: 0 to 5 percent

Major Component Description

Beaverell
Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.2 inches

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

Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

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

Management

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

851A—Beaverell gravelly loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Beaverell and similar soils: 95 percent

Minor Components
Attewan and similar soils: 0 to 3 percent
Soils that are very shallow to loamy sand: 0 to 2 percent

Major Component Description

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 2.5 inches

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

Management

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

951A—Beaverell very gravelly loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Beaverell and similar soils: 95 percent

Minor Components
Attewan and similar soils: 0 to 3 percent
Soils that are very shallow to sand: 0 to 2 percent

Major Component Description

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

Management

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

Beaverton Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 16 inches and rapid below
Landform: Stream terraces and alluvial fans
Parent material: Alluvium
Slope range: 0 to 25 percent
Elevation range: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal over sandy or sandy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Beaverton very cobbly loam, 0 to 4 percent slopes, in an area of rangeland, 700 feet north and 2,400 feet west of the southeast corner of sec. 34, T. 22 N., R. 8 W.

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

Bt—4 to 13 inches; dark brown (10YR 4/3) very gravelly clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; 15 percent cobbles and 45 percent pebbles; few faint lime coats on undersides of rock fragments in lower part of horizon; slightly alkaline; clear smooth boundary.

Btk—13 to 16 inches; brown (10YR 5/3) extremely gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; many very fine roots; few faint clay films on faces of peds; 20 percent cobbles and 50 percent pebbles; continuous distinct lime casts on undersides of rock fragments; slightly effervescent; slightly alkaline; gradual smooth boundary.

2Bk1—16 to 40 inches; pale brown (10YR 6/3) extremely gravelly loamy sand, dark brown (10YR 4/3) moist; single grain; slightly sticky nonplastic; common very fine roots in upper part and few below; 15 percent cobbles and 65 percent pebbles; continuous distinct lime casts on undersides of rock fragments; strongly effervescent; moderately alkaline; gradual wavy boundary.

2Bk2—40 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly sand, dark brown (10YR 4/3) moist; single grain; few very fine roots; 20 percent cobbles and 50 percent pebbles; continuous distinct lime casts on undersides of rock fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 14 inches; may include all or part of the Bt horizons
Depth to the Btk horizon: 10 to 20 inches

A horizon
- Hue: 2.5Y, 10YR, or 7.5YR
- Value: 4 or 5 dry; 2 or 3 moist
- Chroma: 2 or 3
- Texture: Loam or sandy loam
- Clay content: 10 to 25 percent
- Content of rock fragments: 35 to 60 percent—0 to 5 percent stones; 0 to 25 percent cobbles; 5 to 40 percent pebbles
- Reaction: pH 6.6 to 7.8

Bt and Btk horizons
- Hue: 2.5Y, 10YR, or 7.5YR
- Value: 4 or 5 dry; 2 to 4 moist
- Chroma: 2 or 3
- Texture: Clay loam, sandy clay loam, or sandy loam
- Clay content: 25 to 35 percent
- Content of rock fragments: 35 to 60 percent—0 to 5 percent stones; 0 to 30 percent cobbles; 15 to 45 percent pebbles
- Reaction: pH 6.6 to 7.8

2Bk1 horizon
- Hue: 2.5Y, 10YR, or 7.5YR
- Value: 5 to 7 dry; 4 to 6 moist
- Chroma: 2 to 4
- Texture: Loamy sand or sand
- Clay content: 0 to 10 percent
- Content of rock fragments: 35 to 80 percent—0 to 10 percent stones; 0 to 35 percent cobbles; 15 to 60 percent pebbles
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.4 to 8.4

2Bk2 horizon
- Hue: 2.5Y, 10YR, or 7.5YR
- Value: 5 or 6 dry; 4 to 6 moist
- Chroma: 2 to 4
- Texture: Loamy sand or sand
- Clay content: 0 to 10 percent
- Content of rock fragments: 35 to 80 percent—0 to 5 percent stones; 0 to 35 percent cobbles; 15 to 65 percent pebbles
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 7.4 to 8.4

551B—Beaverton very cobbly loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Beaverton and similar soils: 95 percent

Minor Components
Soils with extremely cobbly loam surfaces: 0 to 3 percent
Soils with gravelly loam surfaces: 0 to 2 percent

Major Component Description

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

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

Management

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

651B—Beaverton very stony sandy loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Beaverton and similar soils: 95 percent

Minor Components
Soils with extremely stony surface layers: 0 to 3 percent
Soils with sandy loam surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Very stony 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 3.1 inches

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

Management

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

751B—Beaverton-Shawmut very gravelly loams, 1 to 4 percent slopes

Setting

Landform:
- Beaverton—Stream terraces
- Shawmut—Stream terraces

Slope:
- Beaverton—1 to 4 percent
- Shawmut—1 to 4 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Beaverton and similar soils: 60 percent
Shawmut and similar soils: 30 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 5 percent
Soils with gravelly loam surface layers: 0 to 5 percent

Major Component Description

Beaverton
Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.0 inches

Shawmut
Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

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

Management

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

Bignell Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Mountains
Parent material: Alluvium, glacial till, or colluvium
Slope range: 8 to 60 percent
Elevation range: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 25 inches
Frost-free period: 70 to 105 days

Taxonomic Class: Clayey-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Bignell very stony loam, 8 to 35 percent slopes, in an area of forestland, 200 feet north and 1,850 feet west of the southeast corner of sec. 20, T. 11 N., R. 5 W.

A—0 to 3 inches; gray (10YR 5/1) very stony loam, very dark gray (10YR 3/1) moist; moderate very fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine roots; 5 percent stones and 25 percent cobbles; slightly acid; clear smooth boundary.

E/Bt—3 to 7 inches; 85 percent light brownish gray (10YR 6/2) cobbly loam, dark grayish brown (10YR 4/2) moist (E part); 15 percent brown (7.5YR 5/4) cobbly clay, dark brown (7.5YR 4/4) moist (B part); moderate very fine subangular blocky structure; soft, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 15 percent cobbles and 10 percent pebbles; moderately acid; clear smooth boundary.

Bt1—7 to 18 inches; brown (7.5YR 5/4) very cobbly clay, dark brown (7.5YR 4/4) moist; moderate medium and coarse subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine and fine tubular and interstitial pores; many distinct clay films on faces of peds; few decomposed tree roots; 15 percent cobbles and 20 percent pebbles; slightly acid; gradual smooth boundary.

Bt2—18 to 32 inches; brown (7.5YR 4/4) very cobbly clay, dark brown (7.5YR 5/4) moist; moderate medium and coarse subangular blocky structure; very hard, firm, moderately sticky, and very plastic; few very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; common dead roots between peds; 30 percent cobbles and 20 percent pebbles; slightly acid; gradual smooth boundary.

Bt3—32 to 45 inches; light yellowish brown (10YR 6/4) very cobbly clay loam, yellowish brown (10YR 5/4) moist; common medium distinct brownish yellow (10YR 6/6) mottles; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 30 percent cobbles and 20 percent pebbles; slightly acid; gradual smooth boundary.

Bt4—45 to 60 inches; light yellowish brown (10YR 6/4) very cobbly clay loam, yellowish brown (10YR 5/6) moist; common medium distinct brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine tubular and interstitial pores; common distinct clay films on faces of peds; 30 percent angular cobbles and 25 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

E/Bt horizon
Hue: E part—7.5YR or 10YR; B part—7.5YR or 10YR
Value: E part—6 or 7 dry, 4 to 6 moist; B part—5 to 7 dry
Chroma: E part—2 or 3; B part—2, 4, or 6
Texture: Loam or sandy clay loam

Clay content: 15 to 25 percent
Content of rock fragments: 25 to 60 percent—0 to 25 percent cobbles; 15 to 55 percent pebbles
Reaction: pH 5.1 to 6.5

Bt horizons
Hue: 5YR, 7.5YR, or 10YR
Value: 5 to 7 dry; 3 to 6 moist
Chroma: 2 to 4 or 6
Texture: Clay, sandy clay, or clay loam
Clay content: 35 to 60 percent
Content of rock fragments: 35 to 60 percent—0 to 30 percent cobbles; 15 to 45 percent pebbles
Reaction: pH 5.1 to 6.5; below 40 inches the pH can range to 7.8

215E—Bignell very stony loam, 8 to 35 percent slopes

Setting

Landform: Mountains
Slope: 8 to 35 percent
Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 25 inches
Frost-free period: 70 to 105 days

Composition

Major Components
Bignell and similar soils: 85 percent

Minor Components
Soils that have slopes more than 35 percent: 0 to 5 percent
Colder soils on north aspects: 0 to 5 percent
Soils with cobbly loam surface layers: 0 to 5 percent

Major Component Description

Surface layer texture: Very stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

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

Management

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

Binna Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 28 inches and rapid below
Landform: Stream terraces and alluvial fans
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Aridic Calciustolls

Typical Pedon

Binna cobbly loam, in an area of Binna-Ashlo complex, 0 to 2 percent slopes, in an area of rangeland, 1,500 feet north and 2,500 feet west of the southeast corner of sec. 21, T. 20 N., R. 6 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy parting to weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 10 percent cobbles and 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—5 to 10 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak medium prismatic parting to weak medium and coarse subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; continuous faint lime casts on undersides of rock fragments; disseminated lime and few fine irregular soft masses and seams of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—10 to 25 inches; light gray (10YR 7/2) loam, pale brown (10YR 6/3) moist; weak medium and coarse prismatic parting to weak medium and coarse angular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; continuous distinct lime casts on undersides of rock fragments; disseminated lime; common medium irregular soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk3—25 to 28 inches; very pale brown (10YR 7/3) extremely cobbly sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots; 30 percent cobbles and 35 percent pebbles; continuous distinct lime coats on rock fragments; continuous prominent lime casts on undersides of rock fragments; lime-cemented fine sand and pebbles on undersides of cobbles; violently effervescent; moderately alkaline; clear smooth boundary.

2Bk4—28 to 60 inches; pale brown (10YR 6/3) extremely cobbly loamy sand, dark brown (10YR 4/3) moist; single grain; loose; slightly sticky nonplastic; few very fine roots in upper part; 40 percent cobbles and 40 percent pebbles; continuous prominent lime casts on undersides of rock fragments; lime cemented fine sand and pebbles on undersides of cobbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 10 inches
Depth to the sandy-skeletal horizon: 20 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry (5 dry when mixed to 7 inches)
Chroma: 2 or 3
Clay content: 15 to 27 percent
Content of rock fragments: 15 to 35 percent—5 to 10 percent cobbles; 5 to 25 percent pebbles
Reaction: pH 7.4 to 8.4

Bk1 and Bk2 horizons
Hue: 10YR or 2.5Y
Value: 7 or 8 dry; 5 or 6 moist
Chroma: 2 or 3
Clay content: 18 to 27 percent
Content of rock fragments: 0 to 30 percent—0 to 10 percent cobbles; 0 to 20 percent pebbles
Calcium carbonate equivalent: 15 to 30 percent
Reaction: pH 7.9 to 9.0

Bk3 horizon
Hue: 10YR or 2.5Y
Value: 7 or 8 dry; 5 or 6 moist
Chroma: 2 or 3
Texture: Loam or sandy loam
Clay content: 10 to 25 percent
Content of rock fragments: 0 to 30 percent—0 to 10 percent cobbles; 0 to 20 percent pebbles
Calcium carbonate equivalent: 10 to 30 percent
Reaction: pH 7.9 to 9.0

2Bk4 horizon
Hue: 10YR or 2.5Y
Value: 6 to 8 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Sand or loamy sand
Clay content: 0 to 10 percent
Content of rock fragments: 35 to 80 percent—5 to 15 percent cobbles; 30 to 65 percent pebbles
Calcium carbonate equivalent: 10 to 20 percent
Reaction: pH 7.9 to 9.0

137A—Binna-Ashlo complex, 0 to 2 percent slopes

Setting

Landform:
- Binna—Stream terraces
- Ashlo—Stream terraces

Slope:
- Binna—0 to 2 percent
- Ashlo—0 to 2 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Binna and similar soils: 60 percent
Ashlo and similar soils: 30 percent

Minor Components
Rothiemay and similar soils: 0 to 6 percent
Soils with extremely cobbly loam surfaces: 0 to 4 percent

Major Component Description

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

Ashlo
Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.5 inches

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

Management

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

Binvar Series

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Moderate to a depth of 24 inches and rapid below
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Aeric Calciaquolls

Typical Pedon

Binvar cobbly loam, 0 to 2 percent slopes, in an area of grassland, 30 feet south and 500 feet west of the northeast corner of sec. 23, T. 20 N., R. 6 W.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) cobbly loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine roots; 10 percent cobbles and 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—6 to 12 inches; brown (10YR 5/3) loam, very pale brown (10YR 7/3) dry; weak medium prismatic parting to weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; 10 percent pebbles; continuous distinct lime casts on undersides of pebbles; disseminated lime; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—12 to 20 inches; pale brown (10YR 6/3) loam, white (10YR 8/2) dry; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; 10 percent pebbles; disseminated lime; many fine soft masses of lime; continuous distinct lime coats on pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—20 to 24 inches; very pale brown (10YR 7/3) very gravelly loam, white (10YR 8/2) dry; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; 10 percent cobbles and 40 percent pebbles; disseminated lime; many fine soft masses of lime; continuous distinct lime coats on cobbles and pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk4—24 to 36 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, white (10YR 8/2) dry; massive; soft, very friable, slightly sticky, nonplastic; 20 percent cobbles and 45 percent pebbles; disseminated lime; many fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

2C—36 to 60 inches; dark brown (10YR 4/3) extremely gravelly loamy sand, pale brown (10YR 6/3) dry; single grain; loose, nonsticky, nonplastic; 15 percent cobbles and 50 percent pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the 2C horizon: 20 to 40 inches
Depth to the seasonal high water table: 12 to 24 inches

A horizon
- Hue: 10YR or 2.5Y
- Value: 2 or 3 moist; 4 or 5 dry
- Chroma: 1 or 2
- Clay content: 18 to 25 percent
- Content of rock fragments: 15 to 35 percent—10 to 20 percent cobbles; 5 to 15 percent pebbles
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 7.4 to 8.4

Bk1 and Bk2 horizons
- Hue: 10YR or 2.5YR
- Value: 4 to 6 moist; 5 to 8 dry
- Chroma: 2 to 4
- Clay content: 18 to 25 percent
- Content of rock fragments: 5 to 15 percent—0 to 5 percent cobbles; 5 to 10 percent pebbles
- Calcium carbonate equivalent: 20 to 30 percent
- Reaction: pH 7.9 to 8.4

Bk3 and Bk4 horizons
Hue: 10YR or 2.5YR
Value: 5 to 7 moist; 7 or 8 dry
Chroma: 2 or 3
Texture: Loam or sandy loam
Clay content: 10 to 15 percent
Content of rock fragments: 50 to 75 percent—10 to 20 percent cobbles; 40 to 55 percent pebbles
Calcium carbonate equivalent: 20 to 30 percent
Reaction: pH 7.9 to 8.4

2C horizon
Hue: 10YR or 2.5Y
Value: 4 to 6 moist; 5 to 7 dry
Chroma: 3 or 4
Texture: Loamy sand or sand
Clay content: 0 to 5 percent
Content of rock fragments: 60 to 80 percent—10 to 20 percent cobbles; 50 to 60 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

122A—Binvar cobbly loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Binvar and similar soils: 90 percent

Minor Components
Soils with more rock fragments: 0 to 4 percent
Somewhat poorly drained soils: 0 to 2 percent
Soils with loam surface layers: 0 to 2 percent
Soils with clay loam surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 12 to 24 inches
Available water capacity: Mainly 4.3 inches

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

Management

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

Blaincreek Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills
Parent material: Residuum derived from igneous bedrock
Slope range: 4 to 35 percent
Elevation range: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Blaincreek gravelly loam, in an area of Blaincreek-Castner gravelly loams, 4 to 25 percent slopes, in an area of rangeland, 1,800 feet south and 1,700 feet west of the northeast corner of sec. 16, T. 15 N., R. 4 W.

A—0 to 4 inches; brown (7.5YR 5/2) gravelly loam, dark brown (7.5YR 3/2) moist; weak very thin platy parting to weak very fine granular structure; soft, very friable, moderately sticky, slightly plastic; many very fine roots; 25 percent angular and rounded pebbles; neutral; clear smooth boundary.

Bt1—4 to 12 inches; dark brown (7.5YR 4/2) gravelly clay loam, dark brown (7.5YR 3/2) moist; moderate medium prismatic parting to moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds; 30 percent angular and rounded pebbles; neutral; gradual smooth boundary.

Bt2—12 to 24 inches; brown (7.5YR 5/2) very gravelly loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct dark brown

(7.5YR 3/4) clay films on faces of peds; 50 percent angular and rounded pebbles; neutral; gradual smooth boundary.
R—24 inches; hard igneous bedrock; few cracks; few very fine roots in some cracks; continuous faint lime coats in cracks.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Depth to bedrock: 20 to 40 inches

A horizon
Hue: 10YR or 7.5YR
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 15 to 25 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent angular and rounded pebbles
Reaction: pH 6.1 to 7.3

Bt1 horizon
Hue: 10YR or 7.5YR
Value: 4 or 5 dry
Chroma: 2 or 3
Clay content: 27 to 35 percent
Content of rock fragments: 30 to 60 percent—0 to 10 percent angular cobbles; 30 to 50 percent angular and rounded pebbles
Reaction: pH 6.6 to 7.8

Bt2 horizon
Hue: 10YR or 7.5YR
Value: 5 or 6 dry
Chroma: 2 to 4
Texture: Loam or clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 35 to 60 percent—5 to 10 percent angular cobbles; 30 to 50 percent angular and rounded pebbles
Reaction: pH 6.6 to 7.8

260D—Blaincreek-Castner gravelly loams, 4 to 25 percent slopes

Setting

Landform:
- Blaincreek—Hills
- Castner—Hills

Position on landform:
- Blaincreek—Backslopes
- Castner—Backslopes and shoulders

Slope:
- Blaincreek—4 to 25 percent
- Castner—4 to 25 percent

Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Blaincreek and similar soils: 50 percent
Castner and similar soils: 40 percent

Minor Components
Areas of rock outcrop: 0 to 4 percent
Very shallow soils: 0 to 4 percent
Soils with less rock fragments: 0 to 2 percent

Major Component Description

Blaincreek
Surface layer texture: Gravelly loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.4 inches

Castner
Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

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

Management

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

Bridger Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained or moderately well drained
Permeability: Moderately slow
Landform: Mountains
Parent material: Alluvium, glacial till, or colluvium
Slope range: 4 to 35 percent
Elevation range: 4,800 to 6,500 feet

Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Fine, mixed, superactive Ustic Argicryolls

Typical Pedon

Bridger loam, 4 to 25 percent slopes, in an area of rangeland, 600 feet north and 1,700 feet west of the southeast corner of sec. 21, T. 19 N., R. 8 W.

A—0 to 8 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 5 percent pebbles; slightly acid; clear smooth boundary.

Bt1—8 to 14 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; strong fine and medium prismatic parting to strong fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 5 percent pebbles; slightly acid; clear smooth boundary.

Bt2—14 to 27 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; strong medium prismatic structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many prominent clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt3—27 to 40 inches; brown (7.5YR 5/4) cobbly clay loam, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; 15 percent cobbles and 15 percent pebbles; slightly acid; gradual smooth boundary.

Bk—40 to 60 inches; pinkish gray (7.5YR 6/2) very cobbly loam, dark brown (7.5YR 4/2) moist; massive; slightly hard, very friable, moderately sticky, slightly plastic; few very fine roots; 25 percent cobbles and 25 percent pebbles; continuous faint lime casts on undersides of rock fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 38 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 17 to 40 inches

A horizon
- Hue: 7.5YR, 10YR, or 2.5Y
- Value: 2 to 4
- Chroma: 1 or 2
- Clay content: 18 to 27 percent
- Content of rock fragments: 5 to 35 percent—0 to 10 percent stones and cobbles; 5 to 25 percent pebbles
- Reaction: pH 6.1 to 7.3

Bt horizons
- Hue: 7.5YR, 10YR, or 2.5Y
- Value: 5 or 6 dry
- Chroma: 2 to 4
- Texture: Clay loam, silty clay, or clay
- Clay content: 35 to 50 percent
- Content of rock fragments: 5 to 35 percent—0 to 10 percent stones and cobbles; 5 to 25 percent pebbles
- Reaction: pH 6.1 to 7.8

Bk horizon
- Hue: 7.5YR, 10YR, or 2.5Y
- Value: 6 to 8 dry; 4 to 7 moist
- Chroma: 2 to 4
- Texture: Clay loam, sandy clay loam, or loam
- Clay content: 20 to 35 percent
- Content of rock fragments: 5 to 35 percent—0 to 10 percent stones and cobbles; 5 to 25 percent pebbles
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.4 to 9.0

73D—Bridger loam, 4 to 25 percent slopes

Setting

Landform: Mountains
Slope: 4 to 25 percent
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Bridger and similar soils: 85 percent

Minor Components
Leavitt and similar soils: 0 to 5 percent
Soils with stony loam surface layers: 0 to 5 percent
Soils that have slopes more than 25 percent: 0 to 5 percent

Major Component Description

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

Management

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

700D—Bridger silt loam, moderately wet, 4 to 25 percent slopes

Setting

Landform: Mountains
Slope: 4 to 25 percent
Elevation: 4,800 to 5,500 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Bridger and similar soils: 90 percent

Minor Components
Somewhat poorly drained soils: 0 to 4 percent
Poorly drained soils: 0 to 4 percent
Soils with less clay content: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forestland
Flooding: None
Depth to the seasonal high water table: Apparent, 48 to 60 inches
Available water capacity: Mainly 9.5 inches

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

Management

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

Brocko Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Sedimentary plains and hills
Parent material: Loess or lacustrine deposits
Slope range: 2 to 35 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-silty, mixed, superactive, frigid Aridic Calciustepts

Typical Pedon

Brocko silt loam, 2 to 8 percent slopes, in an area of cropland, 1,900 feet south and 2,800 feet east of the northwest corner of sec. 18, T. 10 N., R. 1 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; slightly alkaline; abrupt smooth boundary.

Bk1—5 to 30 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak medium prismatic parting to weak medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; continuous faint lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—30 to 55 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular pores; disseminated lime; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

C—55 to 60 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; 10 percent pebbles; continuous faint lime coats on undersides of pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the calcic horizon: 5 to 8 inches

Ap horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 or 3
Clay content: 10 to 18 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bk horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 7 or 8 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Silt loam, very fine sandy loam, or loam
Clay content: 10 to 18 percent with less than 15 percent fine sand and coarser
Calcium carbonate equivalent: 15 to 35 percent
Reaction: pH 7.9 to 8.4

C horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 6 to 8 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Silt loam, loam, or very fine sandy loam
Clay content: 10 to 18 percent with less than 15 percent fine and coarser sand
Calcium carbonate equivalent: 5 to 25 percent
Gypsum content: 1 to 3 percent
Reaction: pH 7.9 to 8.4

26C—Brocko silt loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Brocko and similar soils: 95 percent

Minor Components
Soils that have slopes more than 8 percent: 0 to 2 percent
Silty clay loam soils: 0 to 2 percent
Soils with noncalcareous surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.9 inches

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

Management

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

26D—Brocko silt loam, 8 to 15 percent slopes

Setting

Landform: Hills
Slope: 8 to 15 percent
Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Brocko and similar soils: 90 percent

Minor Components
Soils that have slopes more than 15 percent: 0 to 5 percent
Silty clay loam soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.9 inches

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

Management

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

139D—Brocko-Chinook complex, 8 to 35 percent slopes

Setting

Landform:
- Brocko—Hills
- Chinook—Hills

Slope:
- Brocko—8 to 35 percent
- Chinook—8 to 35 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Brocko and similar soils: 50 percent
Chinook and similar soils: 40 percent

Minor Components
Lihen and similar soils: 0 to 4 percent
Soils that have slopes more than 35 percent: 0 to 3 percent
Soils that have hard bedrock at shallow depths: 0 to 3 percent

Major Component Description

Brocko
Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Lacustrine deposits
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 11.9 inches

Chinook
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 7.2 inches

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

Management

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

Burgraff Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Sedimentary plains
Parent material: Material weathered from semiconsolidated, sedimentary bedrock
Slope range: 2 to 8 percent
Elevation range: 3,800 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-silty, mixed, superactive, frigid Aridic Calciustolls

Typical Pedon

Burgraff silt loam, in an area of Burgraff-Cabbart complex, 2 to 8 percent slopes, in an area of rangeland, 2,500 feet south and 2,400 feet east of the northwest corner of sec. 34, T. 20 N., R. 6 W.

A1—0 to 3 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; strongly effervescent; slightly alkaline; clear smooth boundary.

A2—3 to 6 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk1—6 to 17 inches; pinkish gray (7.5YR 7/2) silt loam, pinkish gray (7.5YR 6/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent angular pebbles of siltstone; many fine and medium seams of lime; continuous faint lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—17 to 27 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 15 percent angular pebbles of siltstone; common fine and medium seams of lime; continuous faint lime coats on faces of peds;

violently effervescent; moderately alkaline; gradual smooth boundary.
Cr—27 to 60 inches; gray (5Y 6/1) fractured semiconsolidated siltstone; few fine roots in fractures in upper part; strongly effervescent.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 20 to 40 inches

A horizons
Hue: 7.5YR or 10YR
Chroma: 2 or 3
Clay content: 20 to 25 percent
Content of rock fragments: 0 to 15 percent soft channers
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 6.6 to 7.8

Bk horizons
Hue: 7.5YR, 10YR, or 2.5Y
Value: 7 or 8 dry; 5 or 6 moist
Chroma: 2 or 3
Texture: Silt loam or silty clay loam
Clay content: 20 to 30 percent
Content of rock fragments: 0 to 25 percent soft channers
Calcium carbonate equivalent: 25 to 35 percent
Reaction: pH 7.9 to 8.4

582C—Burgraff-Cabbart complex, 2 to 8 percent slopes

Setting

Landform:
- Burgraff—Sedimentary plains
- Cabbart—Sedimentary plains

Position on landform:
- Burgraff—Backslopes
- Cabbart—Backslopes and shoulders

Slope:
- Burgraff—2 to 8 percent
- Cabbart—2 to 8 percent

Elevation: 3,800 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Burgraff and similar soils: 65 percent
Cabbart and similar soils: 25 percent

Minor Components
Rothiemay and similar soils: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 3 percent
Shallow clay loam soils: 0 to 2 percent
Shallow clay textured soils: 0 to 2 percent

Major Component Description

Burgraff
Surface layer texture: Silt loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.0 inches

Cabbart
Surface layer texture: Loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated 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.

Management

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

Cabba Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Sedimentary plains and hills
Parent material: Material derived from sandstone
Slope range: 2 to 60 percent
Elevation range: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy, mixed, superactive, calcareous, frigid, shallow Typic Ustorthents

Typical Pedon

Cabba loam, in an area of Wayden-Cabba-Regent complex, 15 to 45 percent slopes, in an area of rangeland, 800 feet north and 2,200 feet west of the southeast corner of sec. 3, T. 18 N., R. 5 W.

A—0 to 4 inches grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—4 to 10 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 35 percent angular soft sandstone fragments; disseminated lime; continuous faint lime coats on undersides of rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—10 to 18 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine roots; common very fine tubular and interstitial pores; 60 percent angular soft sandstone fragments; disseminated lime; continuous faint lime coats on rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

Cr—18 to 60 inches; light olive gray (5Y 6/2) semiconsolidated sandstone, olive (5Y 4/3) moist; roots matted at upper boundary; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches

A horizon
Hue: 10YR or 2.5Y
Value: 3 to 6 dry; 3 or 4 moist
Chroma: 1 to 4
Clay content: 10 to 27 percent
Electrical conductivity: 0 to 4 mmhos/cm
Effervescence: None to violently
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 9.0

Bk horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 8 dry; 4 to 7 moist
Chroma: 1 to 4 or 6
Texture: Loam, silt loam, clay loam, or silty clay loam
Clay content: 20 to 35 percent
Structure: Massive thin platy, subangular blocky, or prismatic
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 2 to 8 mmhos/cm
Reaction: pH 7.4 to 9.0

Cr horizon
Reaction: pH 7.4 to 8.4

Cabbart Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and sedimentary plains
Parent material: Material derived from semiconsolidated sedimentary bedrock
Slope range: 2 to 60 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy, mixed, superactive, calcareous, frigid, shallow Aridic Ustorthents

Typical Pedon

Cabbart loam, in an area of Delpoint-Cabbart loams, 8 to 35 percent slopes, in an area of rangeland, 1,200 feet north and 900 feet west of the southeast corner of sec. 13, T. 20 N., R. 7 W.

A—0 to 4 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak very thin platy parting to weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 5 percent angular pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—4 to 10 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; 5 percent angular pebbles; disseminated lime; continuous faint lime coats on undersides of pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—10 to 14 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak very fine granular structure; slightly hard, very

friable, slightly sticky, slightly plastic; many very fine and fine roots; 70 percent soft shale fragments; continuous faint lime coats on undersides of pebbles; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—14 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated sedimentary beds, olive gray (5Y 5/2) moist; few fine roots in upper 6 inches; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches

A horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5 to 7 dry; 3 to 5 moist
- Chroma: 2 to 4
- Clay content: 18 to 27 percent
- Content of rock fragments: 0 to 15 percent hard fragments—0 to 5 percent cobbles; 0 to 10 percent pebbles
- Electrical conductivity: 0 to 4 mmhos/cm
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 7.4 to 9.0

Bk horizons
- Hue: 10YR, 2.5Y, or 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
- Structure: Massive, prismatic, or blocky
- Content of rock fragments: 0 to 45 percent—0 to 15 percent hard pebbles, 0 to 45 percent soft pebbles
- Electrical conductivity: 2 to 8 mmhos/cm
- Sodium adsorption ratio: 1 to 5
- Calcium carbonate equivalent: 15 to 25 percent
- Reaction: pH 7.4 to 9.0

Cadotte Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 32 inches and rapid below
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 4,500 to 5,000 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Ustic Haplocryalfs

Typical Pedon

Cadotte gravelly loam, 0 to 4 percent slopes, in an area of forestland, 2,450 feet north and 2,500 feet east of the southwest corner of sec. 24, T. 15 N., R. 8 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter of needles and twigs.

A—0 to 3 inches; dark gray (10YR 4/1) gravelly loam, very dark gray (10YR 3/1) moist; weak very thin platy parting to weak very fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine roots; 20 percent pebbles; moderately acid; abrupt smooth boundary.

Bt/A—3 to 8 inches; 80 percent brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist (B part); 20 percent grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist (A part); moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and few medium roots; many very fine tubular and interstitial pores; few distinct clay films on faces of peds; 30 percent pebbles; moderately acid; clear smooth boundary.

Bt1—8 to 18 inches; yellowish brown (10YR 5/4) very gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and few medium roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; moderately acid; clear smooth boundary.

Bt2—18 to 23 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; few faint clay films on faces of peds; 10 percent cobbles and 45 percent pebbles; moderately acid; gradual smooth boundary.

Bt3—23 to 32 inches; brown (10YR 5/3) extremely gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; clay bridging sand grains;

20 percent cobbles and 45 percent pebbles; neutral; gradual smooth boundary.
2Bk—32 to 60 inches; brown (10YR 5/3) extremely gravelly loamy sand, dark brown (10YR 4/3) moist; single grain; loose, slightly sticky, nonplastic; few very fine roots; 20 percent cobbles and 45 percent pebbles; strongly effervescent; continuous faint lime casts on undersides of rock fragments; slightly alkaline.

Range in Characteristics

Soil temperature: 38 to 44 degrees F
Depth to the 2Bk horizon: 20 to 40 inches
Other features: When mixed to a depth of 7 inches, the dark-colored A horizon will not meet the requirements for a mollic epipedon

A horizon
Value: 4 to 6 dry; 3 or 4 moist
Chroma: 1 to 3
Clay content: 15 to 25 percent
Content of rock fragments: 15 to 35 percent pebbles
Reaction: pH 5.6 to 6.0

Bt/A horizon
Value: B part—5 or 6 dry; 3 or 4 moist; A part—5 or 6 dry; 3 or 4 moist
Chroma: B part—3 or 4; A part—2 or 3
Clay content: 15 to 25 percent
Content of rock fragments: 15 to 35 percent pebbles
Reaction: pH 5.6 to 6.0

Bt1 and Bt2 horizons
Hue: 10YR or 7.5YR
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 3 or 4
Texture: Loam, sandy loam, or clay loam
Clay content: 18 to 30 percent
Content of rock fragments: 45 to 65 percent—5 to 15 percent cobbles; 40 to 50 percent pebbles
Reaction: pH 5.6 to 6.0

Bt3 horizon
Hue: 10YR or 7.5YR
Value: 5 or 6 dry; 4 moist
Chroma: 2 or 3
Clay content: 5 to 20 percent
Content of rock fragments: 50 to 70 percent—10 to 20 percent cobbles; 40 to 50 percent pebbles
Reaction: pH 5.6 to 7.3

2Bk horizon
Hue: 10YR or 7.5YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Sand or loamy sand
Clay content: 0 to 5 percent
Content of rock fragments: 60 to 75 percent—10 to 20 percent cobbles; 40 to 65 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

91B—Cadotte gravelly loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 4,500 to 5,000 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Cadotte and similar soils: 95 percent

Minor Components
Somewhat poorly drained soils: 0 to 2 percent
Soils that are shallow to sand and gravel: 0 to 2 percent
Soils with darker colored surface layers: 0 to 1 percent

Major Component Description

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: Forestland
Flooding: None
Available water capacity: Mainly 3.4 inches

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

Management

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

Castner Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and mountains
Parent material: Material derived from argillite, igneous, and sandstone bedrock
Slope range: 4 to 60 percent
Elevation range: 3,500 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lithic Haplustolls

Typical Pedon

Castner channery loam, in an area of Holter-Castner channery loams, 8 to 45 percent slopes, in an area of rangeland, 1,000 feet south and 900 feet east of the northwest corner of sec. 28, T. 13 N., R. 4 W.

A1—0 to 3 inches; brown (10YR 5/3) channery loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 30 percent channers; neutral; clear smooth boundary.

A2—3 to 8 inches; grayish brown (10YR 5/2) very channery loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic parting to moderate very fine and fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; 45 percent channers; neutral; clear smooth boundary.

Bk—8 to 16 inches; yellowish brown (10YR 5/4) very channery loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 60 percent channers; few thin lime coats on undersides of rock fragments; neutral; abrupt smooth boundary.

R—16 inches; fractured argillite bedrock with few cracks; few fine roots in some cracks.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Depth to bedrock: 10 to 20 inches
Depth to the Bk horizon: 7 to 15 inches
Soil phases: Stony

A1 horizon
Hue: 2.5Y, 10YR, 7.5YR, or 5YR
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 1 to 3
Texture: Loam or sandy loam
Clay content: 5 to 18 percent with less than 35 percent fine and coarser sand
Content of rock fragments: 15 to 35 percent—0 to 5 percent stones and cobbles; 15 to 30 percent pebbles or channers
Reaction: pH 6.6 to 7.8

A2 horizon
Hue: 2.5Y, 10YR, 7.5YR, or 5YR
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 1 to 3
Texture: Loam or sandy loam
Clay content: 10 to 18 percent with less than 35 percent fine and coarser sand
Content of rock fragments: 35 to 70 percent—5 to 20 percent stones and cobbles; 30 to 55 percent pebbles or channers
Reaction: pH 6.6 to 8.4

Bk horizon
Hue: 2.5Y, 10YR, 7.5YR, or 5YR
Value: 4 to 6 dry; 3 to 5 moist
Chroma: 2 to 4
Texture: Loam or sandy loam
Clay content: 10 to 18 percent with less than 35 percent fine and coarser sand
Content of rock fragments: 35 to 80 percent—10 to 25 percent stones and cobbles; 25 to 60 percent pebbles or channers
Calcium carbonate equivalent: 3 to 15 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 6.6 to 8.4

160D—Castner-Blaincreek-Rock outcrop complex, 4 to 35 percent slopes

Setting

Landform:
- Castner—Hills
- Blaincreek—Hills

Position on landform:
- Castner—Backslopes and shoulders
- Blaincreek—Backslopes and footslopes
- Rock outcrop—Shoulders

Slope:
- Castner—4 to 35 percent
- Blaincreek—4 to 35 percent

Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Castner and similar soils: 55 percent
Blaincreek and similar soils: 30 percent
Rock outcrop: 10 percent

Minor Components
Farnuf and similar soils: 0 to 3 percent
Soils that have slopes more than 35 percent: 0 to 2 percent

Major Component Description

Castner
Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

Blaincreek
Surface layer texture: Gravelly loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.4 inches

Rock outcrop
Definition: Hard igneous bedrock

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

Management

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

360F—Castner-Holter-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform:
- Castner—Hills
- Holter—Hills

Position on landform:
- Castner—Backslopes and shoulders
- Holter—Backslopes and footslopes
- Rock outcrop—Shoulders

Slope:
- Castner—15 to 60 percent
- Holter—15 to 45 percent

Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Castner and similar soils: 45 percent
Holter and similar soils: 35 percent
Rock outcrop: 15 percent

Minor Components
Mocmont soils on north aspects: 0 to 3 percent
Mocmont soils on east aspects: 0 to 2 percent

Major Component Description

Castner
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

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

Rock outcrop
Definition: Hard igneous and argillite bedrock

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

Management

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

863E—Castner-Tolex-Rock outcrop complex, 8 to 60 percent slopes

Setting

Landform:
- Castner—Mountains
- Tolex—Mountains

Slope:
- Castner—8 to 60 percent
- Tolex—8 to 60 percent

Elevation: 3,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Castner and similar soils: 40 percent
Tolex and similar soils: 35 percent
Rock outcrop: 20 percent

Minor Components
Very deep loam textured soils: 0 to 5 percent

Major Component Description

Castner
Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

Tolex
Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.3 inches

Rock outcrop
Definition: Hard igneous and argillite bedrock

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

Management

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

Cheadle Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Material derived from hard sedimentary rock, hard argillite, or igneous rock
Slope range: 15 to 60 percent
Elevation range: 4,800 to 7,800 feet
Mean annual precipitation: 20 to 35 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Lithic Haplocryolls

Typical Pedon

Cheadle very channery loam, in an area of Libeg-Cheadle very channery loams, 15 to 45 percent slopes, in an area of rangeland, 2,600 feet north and 2,200 feet west of the southeast corner of sec. 17, T. 11 N., R. 5 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) very channery loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 55 percent channers; neutral; clear smooth boundary.

Bw—7 to 14 inches; brown (10YR 5/3) very channery loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; 60 percent channers; slightly alkaline; abrupt wavy boundary.

R—14 inches; hard argillite bedrock with few cracks; few fine roots in some cracks.

Range in Characteristics

Soil temperature: 37 to 47 degrees F; mean summer is less than 59 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to bedrock: 10 to 20 inches
Soil phases: Nonstony

A horizon
Hue: 2.5Y, 10YR, or 7.5YR
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 1 or 2
Clay content: 10 to 27 percent
Content of rock fragments: 35 to 60 percent channers
Reaction: pH 6.6 to 7.8

Bw horizon
Hue: 2.5Y, 10YR, or 7.5YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 3 or 4
Texture: Loam, fine sandy loam, or sandy loam
Clay content: 10 to 27 percent
Content of rock fragments: 35 to 75 percent channers
Reaction: pH 7.4 to 9.0

Chinook Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Alluvial fans and hills
Parent material: Alluvium
Slope range: 2 to 35 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Aridic Haplustolls

Typical Pedon

Chinook sandy loam, in an area of Assinniboine-Chinook sandy loams, 2 to 8 percent slopes, in an area of rangeland, 300 feet north and 2,500 feet west of the southeast corner of sec. 25, T. 11 N., R. 4 W.

A1—0 to 5 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; slightly alkaline; clear smooth boundary.

A2—5 to 8 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine tubular and interstitial pores; slightly alkaline; clear smooth boundary.

Bw—8 to 16 inches; light grayish brown (10YR 6/2) sandy loam, very dark grayish brown (10YR 3/3) moist; weak medium prismatic structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; few brown to dark brown (10YR 4/3) moist, faint clay films on peds and bridging of sand grains; few thin white lime coats on faces of peds and undersides of pebbles; 10 percent pebbles; neutral; gradual smooth boundary.

Bk1—16 to 38 inches; light gray (2.5Y 7/2) sandy loam, grayish brown (2.5Y 5/2) moist; weak coarse prismatic structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 10 percent pebbles; disseminated lime; many distinct lime coats on faces of peds and undersides of pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—38 to 50 inches; very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; 10 percent pebbles; disseminated lime; many distinct lime coats on faces of peds and undersides of pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—50 to 60 inches; light gray (2.5Y 7/2) loamy sand, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; 10 percent pebbles; disseminated lime; few faint lime coats on faces of peds and pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Depth to the 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 15 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
Textures: Fine sandy loam or sandy loam
Clay content: 5 to 18 percent—more than 50 percent medium, fine, and coarser sand
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
Textures: Fine sandy loam or sandy loam
Clay content: 5 to 18 percent—more than 50 percent medium, fine, and coarser sand
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.6 to 8.4

Bk1 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 to 4
Textures: Fine sandy loam or sandy loam
Clay content: 5 to 18 percent—more than 50 percent medium, fine, and coarser sand
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 3 to 15 percent
Reaction: pH 6.6 to 9.0

Bk2 and Bk3 horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loamy sand, fine sandy loam, or sandy loam
Clay content: 5 to 18 percent—more than 50 percent medium, fine, and coarser sand
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 3 to 15 percent
Reaction: pH 6.6 to 9.0

39B—Chinook sandy loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Chinook and similar soils: 90 percent

Minor Components
Amesha and similar soils: 0 to 3 percent
Assinniboine and similar soils: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 2 percent
Soils with sand and gravel at 30 inches: 0 to 1 percent
Soils with silt loam layers: 0 to 1 percent

Major Component Description

Surface layer texture: Sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.2 inches

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

Management

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

Comad Series

Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Permeability: Rapid
Landform: Mountains
Parent material: Colluvium derived from granitic rock
Slope range: 25 to 45 percent
Elevation range: 5,000 to 6,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Sandy-skeletal, mixed Lamellic Cryorthents

Typical Pedon

Comad extremely stony sandy loam, 25 to 45 percent slopes, in an area of forestland, 2,200 feet south and 1,200 feet west of the northeast corner of sec. 35, T. 12 N., R. 6 W.

Oi—4 inches to 0; forest litter of partly decomposed needles, twigs, and bark; clear smooth boundary.
E1—0 to 5 inches; light brownish gray (10YR 6/2) extremely stony sandy loam, brown (10YR 5/3) moist; moderate very fine and fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium and coarse roots; 30 percent stones, 25 percent cobbles, and 15 percent pebbles; strongly acid; clear smooth boundary.

E2—5 to 17 inches; pale brown (10YR 7/3) extremely stony loamy sand, brown (10YR 5/3) moist; weak fine and medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; 30 percent stones, 25 percent cobbles, and 15 percent pebbles; strongly acid; gradual wavy boundary.

E and Bt1—17 to 30 inches; 90 percent very pale brown (10YR 7/3) extremely stony loamy sand, yellowish brown (10YR 5/4) moist, weak fine and medium granular structure, slightly hard, very friable, nonsticky, nonplastic (E part); 10 percent yellowish brown (10YR 5/4) sandy clay loam lamellae; hard, friable, slightly sticky, slightly plastic; 1/8- to 1/2-inch thick lamellae that are wavy and discontinuous and 2 to 6 inches apart (B part); common very fine and fine and few medium roots; many very fine tubular and interstitial pores; 30 percent stones, 25 percent cobbles, and 20 percent pebbles; moderately acid; gradual smooth boundary.

E and Bt2—30 to 60 inches; 95 percent very pale brown (10YR 7/4) extremely stony loamy sand, yellowish brown (10YR 5/6) moist; massive; slightly hard, very friable, slightly sticky, nonplastic; few fine and medium roots; few very fine tubular pores (E part); 5 percent few thin discontinuous dark yellowish brown (10YR 4/4) moist sandy loam lamellae; 35 percent stones, 30 percent cobbles, and 15 percent pebbles; moderately acid (B part).

Range in Characteristics

Soil temperature: 36 to 43 degrees F
Depth to lamellae: 13 to 20 inches

E1 horizon
Hue: 7.5YR or 10YR
Value: 6 or 7 dry; 3 to 5 moist
Chroma: 2 or 3
Clay content: 5 to 15 percent
Content of rock fragments: 60 to 85 percent—15 to 35 percent stones; 20 to 30 percent cobbles; 10 to 15 percent pebbles
Reaction: pH 5.1 to 7.3

E2 horizon
Hue: 7.5YR or 10YR
Value: 6 to 8 dry; 3 to 6 moist
Chroma: 2 or 3
Clay content: 5 to 15 percent
Content of rock fragments: 35 to 80 percent—10 to 35 percent boulders and stones; 15 to 25 percent cobbles; 10 to 20 percent pebbles
Reaction: pH 5.1 to 7.3

E and Bt1 horizon
Hue: 7.5YR or 10YR
Value: E part—6 or 7 dry; 4 to 6 moist; B part—5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4 or 6
Texture: Sand, coarse sand, or loamy sand; the lamellae are sandy loam or sandy clay loam.
Clay content: 0 to 10 percent
Content of rock fragments: 40 to 80 percent—15 to 35 percent stones; 15 to 25 percent cobbles; 10 to 20 percent pebbles
Reaction: pH 5.6 to 7.3

E and Bt2 horizon
Hue: 7.5YR or 10YR
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4, or 6
Texture: Sand, coarse sand or loamy sand; the lamellae are sandy loam or sandy clay loam.
Clay content: 0 to 10 percent
Content of rock fragments: 45 to 80 percent—20 to 35 percent boulders and stones; 15 to 30 percent cobbles; 10 to 20 percent pebbles
Reaction: pH 5.6 to 7.3

86F—Comad extremely stony sandy loam, 25 to 45 percent slopes

Setting

Landform: Mountains
Slope: 25 to 45 percent
Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Comad and similar soils: 85 percent

Minor Components
Soils that have slopes more than 45 percent: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Very deep loam soils: 0 to 5 percent

Major Component Description

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

Drainage class: Excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
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.

Management

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

Cowood Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Material derived from igneous and argillite bedrock
Slope range: 25 to 60 percent
Elevation range: 5,000 to 7,800 feet
Mean annual precipitation: 20 to 35 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Lithic Eutrocryepts

Typical Pedon

Cowood very channery loam, in an area of Shadow-Cowood complex, 25 to 60 percent slopes, in an area of forestland, 2,650 feet north and 1,700 feet east of the southwest corner of sec. 29, T. 14 N., R. 5 W.

Oi—1 inch to 0; root mat and forest litter of needles and twigs; abrupt smooth boundary.
E—0 to 4 inches; brown (10YR 5/3) very channery loam, dark brown (10YR 4/3) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; many very fine tubular and interstitial pores; many silt and sand skeletans on faces of peds; 40 percent channers; strongly acid; clear smooth boundary.
Bw—4 to 15 inches; light yellowish brown (10YR 6/4) extremely channery loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky parting to moderate very fine and fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine tubular and interstitial pores; 65 percent channers; strongly acid; abrupt wavy boundary.
R—15 inches; hard argillite bedrock with few vertical cracks; few fine roots in some cracks.

Range in Characteristics

Soil temperature: 35 to 40 degrees F
Depth to bedrock: 10 to 20 inches

E horizon
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Content of rock fragments: 35 to 50 percent channers
Reaction: pH 5.1 to 6.0

Bw horizon
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 3, 4, or 6
Clay content: 10 to 20 percent
Content of rock fragments: 60 to 80 percent channers
Reaction: pH 5.1 to 6.5

793F—Cowood-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform: Mountains
Slope: 25 to 60 percent
Elevation: 6,500 to 7,800 feet
Mean annual precipitation: 25 to 35 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Cowood and similar soils: 70 percent
Rock outcrop: 25 percent

Minor Components
Cheadle and similar soils: 0 to 2 percent
Stemple and similar soils: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Cowood
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland

Flooding: None
Available water capacity: Mainly 1.0 inches

Rock outcrop
Definition: Hard argillite and igneous bedrock

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

Management

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

893F—Cowood-Cheadle-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform:
- Cowood—Mountains
- Cheadle—Mountains

Slope:
- Cowood—25 to 60 percent
- Cheadle—25 to 60 percent

Elevation: 6,000 to 7,800 feet
Mean annual precipitation: 25 to 35 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Cowood and similar soils: 45 percent
Cheadle and similar soils: 30 percent
Rock outcrop: 15 percent

Minor Components
Stemple and similar soils: 0 to 5 percent
Moderately deep soils: 0 to 5 percent

Major Component Description

Cowood
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.0 inches

Cheadle
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.2 inches

Rock outcrop
Definition: Hard argillite and igneous bedrock

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

Management

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

Crago Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills, mountains, alluvial fans, and stream terraces
Parent material: Alluvium and colluvium from limestone
Slope range: 0 to 45 percent
Elevation range: 3,600 to 5,500 feet
Mean annual precipitation: 10 to 15 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid Aridic Calciustepts

Typical Pedon

Crago gravelly loam, 0 to 8 percent slopes, in an area of rangeland, 1,000 feet north and 1,600 feet east of the southwest corner of sec. 16, T. 12 N., R. 5 W.

A—0 to 4 inches; light brownish gray (10YR 6/2) gravelly loam, dark brown (10YR 4/3) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 35 percent pebbles; common fine white lime coats on undersides of rock fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—4 to 10 inches; white (10YR 8/2) very gravelly loam, pale brown (10YR 6/3) moist; weak fine and medium angular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; 50 percent pebbles; disseminated lime; continuous distinct lime coats on undersides of rock fragments; violently

effervescent; moderately alkaline; gradual smooth boundary.
Bk2—10 to 32 inches; white (10YR 8/2) very gravelly loam, pale brown (10YR 6/3) moist; weak medium and coarse angular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 55 percent pebbles; disseminated lime; continuous distinct lime casts on undersides of rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk3—32 to 60 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, moderately sticky, slightly plastic; few very fine roots; 65 percent pebbles; continuous distinct lime casts on undersides of pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Soil phases: Stony

A horizon
Hue: 5Y, 2.5Y, or 7.5YR
Value: 4 to 6 dry; 3 to 5 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent
Content of rock fragments: 15 to 60 percent—5 to 30 percent stones and cobbles; 10 to 30 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Bk1 horizon
Hue: 5Y, 2.5Y, or 7.5YR
Value: 5 to 8 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or sandy clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 15 to 75 percent—0 to 30 percent stones and cobbles; 15 to 60 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent in the fine earth fraction; 40 percent for the whole soil, including coarse fragments less than 3/4-inch in size
Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons
Hue: 2.5Y or 10YR
Value: 6 to 8 dry; 4 to 7 moist
Chroma: 2 to 4
Texture: Loam, sandy loam, sandy clay loam, or clay loam
Clay content: 18 to 35 percent
Calcium carbonate equivalent: 15 to 30 percent for fine earth fraction; 40 to 70 percent for the whole soil, including coarse rock fragments less than 3/4-inch in size
Reaction: pH 7.4 to 8.4

141E—Crago-Pensore channery loams, 15 to 45 percent slopes

Setting

Landform:
- Crago—Hills
- Pensore—Hills

Position on landform:
- Crago—Backslopes and footslopes
- Pensore—Backslopes and shoulders

Slope:
- Crago—15 to 45 percent
- Pensore—15 to 45 percent

Elevation: 3,800 to 5,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Crago and similar soils: 55 percent
Pensore and similar soils: 35 percent

Minor Components
Whitecow and similar soils: 0 to 3 percent
Musselshell and similar soils: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Moderately deep soils: 0 to 2 percent

Major Component Description

Crago
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

Pensore
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Rangeland
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.

Management

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

433E—Crago-Musselshell gravelly loams, 4 to 35 percent slopes

Setting

Landform:
- Crago—Alluvial fans
- Musselshell—Alluvial fans

Slope:
- Crago—4 to 35 percent
- Musselshell—4 to 35 percent

Elevation: 3,600 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Crago and similar soils: 50 percent
Musselshell and similar soils: 40 percent

Minor Components
Amesha and similar soils: 0 to 3 percent
Soils that have slopes more than 35 percent: 0 to 3 percent
Soils with cobbly loam surface layers: 0 to 2 percent
Soils with stony loam surface layers: 0 to 1 percent
Soils shallow to bedrock: 0 to 1 percent

Major Component Description

Crago
Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

Musselshell
Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.5 inches

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

Management

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

637B—Crago gravelly loam, 0 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 8 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Crago and similar soils: 90 percent

Minor Components
Musselshell and similar soils: 0 to 5 percent
Soils with extremely gravelly substratums: 0 to 5 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

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

Management

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

Crittenden Series

Depth class: Deep (40 to 60 inches)
Drainage class: Well drained

Permeability: Moderate to a depth of 31 inches and rapid below
Landform: Hills and bedrock-floored plains
Parent material: Material derived from granitic rock
Slope range: 4 to 35 percent
Elevation range: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Argiustolls

Typical Pedon

Crittenden sandy loam, in an area of Crittenden-Tolman complex, 4 to 35 percent slopes, in an area of rangeland, 650 feet north and 200 feet east of the southwest corner of sec. 35, T. 11 N., R. 4 W.

A—0 to 5 inches; grayish brown (10YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy parting to moderate very fine granular structure; soft; very friable, slightly sticky, nonplastic; many very fine roots; 5 percent pebbles; slightly acid; clear smooth boundary.

Bt—5 to 20 inches; pale brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; clay bridging between mineral grains; slightly alkaline; gradual smooth boundary.

Bk1—20 to 31 inches; light gray (2.5Y 7/2) gravelly sandy loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 20 percent angular pebbles; common fine soft masses of lime; continuous distinct lime coats on undersides of pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

2Bk2—31 to 50 inches; reddish yellow (7.5YR 6/6) very gravelly loamy coarse sand, brown (7.5YR 5/4) moist; massive; loose, slightly sticky, nonplastic; few very fine roots; 50 percent angular pebbles; common fine soft masses of lime; continuous distinct lime coats on undersides of pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary.

R—50 inches; hard granitic rock with few cracks.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the sandy-skeletal 2Bk2 horizon: 20 to 40 inches
Depth to the R horizon: 40 to 60 inches

A horizon
Chroma: 2 or 3
Clay content: 10 to 20 percent
Content of rock fragments: 0 to 15 percent angular pebbles
Reaction: pH 6.1 to 7.3

Bt horizon
Value: 5 or 6 dry; 4 moist
Chroma: 3 or 4
Texture: Sandy clay loam or clay loam
Clay content: 20 to 30 percent
Content of rock fragments: 0 to 15 percent angular pebbles
Reaction: pH 6.6 to 7.8

Bk1 horizon
Hue: 10YR or 2.5Y
Value: 6 to 8 dry; 5 or 6 moist
Chroma: 2 or 3
Texture: Sandy loam or loam
Clay content: 10 to 20 percent
Content of rock fragments: 10 to 30 percent angular pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

2Bk2 horizon
Hue: 7.5YR, 10YR, 2.5Y, or 5Y
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 to 4 or 6
Texture: Loamy coarse sand or coarse sand
Clay content: 0 to 5 percent
Content of rock fragments: 35 to 60 percent angular pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

138D—Crittenden-Tolman complex, 4 to 35 percent slopes

Setting

Landform:
- Crittenden—Hills
- Tolman—Hills

Position on landform:
- Crittenden—Backslopes and footslopes
- Tolman—Backslopes and shoulders

Slope:
- Crittenden—4 to 25 percent
- Tolman—4 to 35 percent

Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Crittenden and similar soils: 70 percent
Tolman and similar soils: 25 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Moderately deep soils: 0 to 2 percent
Deep, calcareous silt loam soil: 0 to 1 percent

Major Component Description

Crittenden
Surface layer texture: Sandy loam
Depth class: Deep (40 to 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from granitic rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.8 inches

Tolman
Surface layer texture: Sandy clay loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from igneous rocks
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.

Management

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

738B—Crittenden-Kalsted, bedrock substratum, sandy loams, 2 to 8 percent slopes

Setting

Landform:
- Crittenden—Bedrock-floored plains
- Kalsted—Bedrock-floored plains

Slope:
- Crittenden—2 to 8 percent
- Kalsted—2 to 8 percent

Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Crittenden and similar soils: 50 percent
Kalsted and similar soils: 40 percent

Minor Components
Areas of rock outcrop: 0 to 4 percent
Moderately deep soils: 0 to 3 percent
Very deep loamy soils: 0 to 3 percent

Major Component Description

Crittenden
Surface layer texture: Sandy loam
Depth class: Deep (40 to 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from granitic rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.8 inches

Kalsted
Surface layer texture: Sandy loam
Depth class: Deep (40 to 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from granitic rocks
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.6 inches

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

Management

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

Crow Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Mountains
Parent material: Alpine till
Slope range: 4 to 25 percent
Elevation range: 4,600 to 5,000 feet
Mean annual precipitation: 20 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Fine, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Crow loam, 4 to 25 percent slopes, in an area of forestland, 900 feet south and 100 feet east of the northwest corner of sec. 3, T. 13 N., R. 9 W.

Oi—2 inches to 0; undecomposed and slightly decomposed forest litter of needles and twigs.
E—0 to 6 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; moderate thin platy parting to moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; 10 percent cobbles and pebbles; moderately acid; clear smooth boundary.
E/Bt—6 to 12 inches; 70 percent light gray (10YR 7/2) loam, brown (10YR 5/3) moist (E part); 30 percent pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist (B part); moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; many silt and sand skeletans on faces of peds; 10 percent cobbles and pebbles; moderately acid; gradual smooth boundary.
Bt1—12 to 28 inches; light yellowish brown (10YR 6/4) clay, dark brown (7.5YR 4/4) moist; strong medium and coarse angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; continuous prominent yellowish brown (10YR 5/4) clay films on faces of peds; common flattened dead roots on faces of peds; 5 percent cobbles and pebbles; slightly acid; gradual smooth boundary.
Bt2—28 to 38 inches; light yellowish brown (10YR 6/4) sandy clay, brown (7.5YR 5/4) moist; moderate coarse angular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; many prominent dark brown (7.5YR 4/4) moist clay films on faces of peds; common flattened dead roots on faces of peds; slightly acid; gradual smooth boundary.
Bt3—38 to 60 inches; light yellowish brown (10YR 6/4) gravelly sandy loam, yellowish brown (10YR 5/4) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; few very fine, fine, and medium roots; common very fine tubular and interstitial pores; common distinct dark brown (7.5YR 4/4) moist clay films on faces of peds and clay bridging of sand grains; 10 percent angular cobbles and 25 percent angular pebbles; slightly acid.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

E horizon
- Value: 5 to 7 dry; 4 or 5 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 5.6 to 6.5

E/Bt horizon
- Hue: 10YR or 2.5Y
- Value: E part—5 or 6 moist; B part—4 or 5 moist
- Chroma: E part—2 or 3; B part—2 to 4
- Textures: Silty clay loam, clay loam, loam, or silt loam
- Clay content: 20 to 40 percent (mixed)
- Content of rock fragments: 0 to 25 percent—0 to 5 percent cobbles; 0 to 25 percent pebbles
- Reaction: pH 5.6 to 6.5

Bt horizons
- Hue: 10YR or 2.5Y
- Value: 4 to 6 dry; 4 or 5 moist
- Chroma: 2 to 4
- Texture: Silty clay, clay, sandy clay, clay loam, or sandy loam
- Clay content: 20 to 60 percent
- Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles
- Reaction: pH 6.1 to 7.3

415D—Crow loam, 4 to 25 percent slopes

Setting

Landform: Mountains
Slope: 4 to 25 percent
Elevation: 4,600 to 5,000 feet
Mean annual precipitation: 20 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Crow and similar soils: 85 percent

Minor Components
Soils with stony loam surface layers: 0 to 4 percent
Soils with cobbly loam surface layers: 0 to 4 percent
Soils that have slopes more than 25 percent: 0 to 4 percent
Soils that are deep to soft bedrock: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
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.

Management

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

Cuniff Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Hills and sedimentary plains
Parent material: Material derived from semiconsolidated sandstone
Slope range: 2 to 35 percent
Elevation range: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy, mixed, superactive, frigid, shallow Typic Haplustolls

Typical Pedon

Cuniff fine sandy loam, in an area of Vebar-Cuniff fine sandy loams, 2 to 8 percent slopes, in an area of rangeland, 2,100 feet north and 2,000 feet east of the southwest corner of sec. 15, T. 19 N., R. 7 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; slightly alkaline; clear smooth boundary.

Bw—5 to 10 inches; light brownish gray (10YR 6/2) fine sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—10 to 16 inches; light brownish gray (2.5Y 6/2) fine sandy loam, grayish brown (2.5Y 5/2) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine roots; common very fine tubular and interstitial pores; 20 percent soft sandstone pebbles; continuous distinct lime coats on undersides of pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Cr—16 to 60 inches; light olive gray (5Y 6/2) semiconsolidated sedimentary beds, olive gray (5Y 5/2) moist; few fine roots between cracks in upper part; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr horizon: 13 to 20 inches

A horizon
Value: 4 or 5 dry
Chroma: 2 or 3
Clay content: 10 to 18 percent
Reaction: pH 6.6 to 7.8

Bw horizon
Value: 5 or 6 dry
Chroma: 2 to 4
Clay content: 8 to 18 percent
Calcium carbonate equivalent: 0 to 5 percent
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 8 to 15 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 8.4

339D—Cuniff-Rock outcrop complex, 2 to 35 percent slopes

Setting

Landform: Hills
Slope: 2 to 35 percent
Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Cuniff and similar soils: 70 percent
Rock outcrop: 20 percent

Minor Components
Areas of blowouts: 0 to 4 percent
Very shallow soils: 0 to 3 percent
Shallow loam textured soils: 0 to 3 percent

Major Component Description

Cuniff
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

Rock outcrop
Definition: Hard and soft sandstone

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

Management

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

DAM—Dam

Composition

Major Components
Dam: 100 percent

Major Component Description

Definition: A barrier built to hold back flowing water.

Delpoint Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and sedimentary plains
Parent material: Material derived from semiconsolidated sandstone or siltstone
Slope range: 2 to 60 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Haplustepts

Typical Pedon

Delpoint loam, in an area of Delpoint-Cabbart loams, 8 to 35 percent slopes, in an area of rangeland, 1,100 feet north and 900 feet west of the southeast corner of sec. 2, T. 20 N., R. 6 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; weak very thin platy parting to weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw—4 to 18 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent sandstone channers; continuous faint lime casts on undersides of channers; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk—18 to 30 inches; light gray (2.5Y 7/2) sandy loam, yellowish brown (2.5Y 5/4) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 20 percent soft sandstone channers; common fine seams and soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.
Cr—30 to 60 inches; pale olive (5Y 6/3) semiconsolidated sedimentary beds, olive (5Y 4/3) moist; few fine roots in cracks in upper part.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 10 to 20 inches
Depth to bedrock: 20 to 40 inches
Other features: When mixed to 7 inches, the A horizon will not meet the requirements for a mollic epipedon.

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
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 6.6 to 8.4

Bw horizon
Hue: 10YR, 2.5Y, or 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
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 6.6 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: 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: 15 to 25 percent
Effervescence: Strongly or violently
Reaction: pH 7.9 to 9.0

257D—Delpoint-Cabbart loams, 8 to 35 percent slopes

Setting

Landform:
- Delpoint—Hills
- Cabbart—Hills

Position on landform:
- Delpoint—Backslopes
- Cabbart—Backslopes and shoulders

Slope:
- Delpoint—8 to 35 percent
- Cabbart—8 to 35 percent

Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Delpoint and similar soils: 60 percent
Cabbart and similar soils: 25 percent

Minor Components
Amesha and similar soils: 0 to 4 percent
Shallow clayey soils: 0 to 4 percent
Areas of rock outcrop: 0 to 4 percent
Moderately deep clayey soils: 0 to 3 percent

Major 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 4.9 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 2.5 inches

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

Management

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

357D—Delpoint-Marmarth-Tolman complex, 8 to 25 percent slopes

Setting

Landform:
- Delpoint—Hills
- Marmarth—Hills
- Tolman—Hills

Position on landform:
- Delpoint—Backslopes
- Marmarth—Footslopes and toeslopes
- Tolman—Backslopes and shoulders

Slope:
- Delpoint—8 to 25 percent
- Marmarth—8 to 25 percent
- Tolman—8 to 25 percent

Elevation: 3,500 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Delpoint and similar soils: 40 percent
Marmarth and similar soils: 30 percent
Tolman and similar soils: 20 percent

Minor Components
Very shallow soils: 0 to 3 percent
Areas of rock outcrop: 0 to 3 percent
Shallow loam soils: 0 to 3 percent
Deep loam soils: 0 to 1 percent

Major 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 4.9 inches

Marmarth
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

Tolman
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
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.

Management

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

457C—Delpoint-Amesha loams, 2 to 8 percent slopes

Setting

Landform:
- Delpoint—Sedimentary plains
- Amesha—Sedimentary plains

Position on landform:
- Delpoint—Backslopes and shoulders
- Amesha—Footslopes and toeslopes

Slope:
- Delpoint—2 to 8 percent
- Amesha—2 to 8 percent

Elevation: 3,500 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Delpoint and similar soils: 45 percent
Amesha and similar soils: 40 percent

Minor Components
Cabbart and similar soils: 0 to 5 percent
Sappington and similar soils: 0 to 5 percent
Moderately deep clayey soils: 0 to 5 percent

Major 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 4.9 inches

Amesha
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

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

Management

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

557F—Delpoint-Cabbart-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform:
- Delpoint—Hills
- Cabbart—Hills

Position on landform:
- Delpoint—Backslopes
- Cabbart—Backslopes and shoulders
- Rock outcrop—Backslopes and shoulders

Slope:
- Delpoint—15 to 60 percent
- Cabbart—15 to 60 percent

Elevation: 3,500 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Delpoint and similar soils: 50 percent
Cabbart and similar soils: 35 percent
Rock outcrop: 10 percent

Minor Components
Very deep loamy soils: 0 to 2 percent
Soils that are shallow to hard bedrock: 0 to 2 percent
Shallow soils with gravel: 0 to 1 percent

Major Component Description

Delpoint
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 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 2.5 inches

Rock outcrop
Definition: Hard sandstone bedrock

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

Management

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

300—Dumps, mine

Composition

Major Components
Dumps: 95 percent

Minor Components
Soils that have slopes more than 35 percent: 0 to 3 percent
Soils with less rock fragments: 0 to 2 percent

Major Component Description

Definition: Rock and soil from placer mining activities
Flooding: None

Elbeth Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 38 inches and rapid below
Landform: Mountains
Parent material: Material derived from coarse-grained granite rock
Slope range: 8 to 35 percent
Elevation range: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Elbeth very stony sandy loam, in an area of Woodgulch-Elbeth-Rock outcrop complex, 8 to 35 percent slopes, in an area of forestland, 200 feet north and 1,400 feet west of the southeast corner of sec. 12, T. 9 N., R. 4 W.

A—0 to 4 inches; gray (10YR 5/1) very stony sandy loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky parting to moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and medium roots; many very fine tubular and interstitial pores; common fine flakes of iron pyrite; slightly acid; gradual smooth boundary.

E—4 to 21 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky parting to moderate fine granular structure; slightly hard, very friable, slightly sticky, nonplastic; common medium and few very fine roots; many very fine tubular and interstitial pores; neutral; gradual smooth boundary.

Bt1—21 to 33 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds and clay bridging of sand grains; neutral; gradual smooth boundary.

Bt2—33 to 38 inches; light yellowish brown (2.5Y 6/4) sandy loam, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds and clay bridging of sand grains; neutral; gradual smooth boundary.

C—38 to 60 inches; light olive gray (5Y 6/2) sand, olive gray (5Y 4/2) moist; massive; slightly hard, very friable, nonsticky, nonplastic; few very fine roots; neutral.

Range in Characteristics

A horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 3 to 5 dry; 2 to 4 moist
Chroma: 1 to 3
Clay content: 10 to 15 percent
Reaction: pH 6.1 to 7.3

E horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 1 to 3
Clay content: 10 to 15 percent
Reaction: pH 6.1 to 7.3

Bt horizons
Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Sandy loam or sandy clay loam
Clay content: 5 to 25 percent
Reaction: pH 6.1 to 7.3

C horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Sand, coarse sand, or loamy sand
Clay content: 0 to 5 percent
Reaction: pH 6.1 to 7.3

Elve Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium
Slope range: 25 to 60 percent
Elevation range: 5,500 to 7,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Ustic Eutrocryepts

Typical Pedon

Elve extremely stony sandy loam, 25 to 60 percent slopes, in an area of forestland, 2,100 feet south and 2,000 feet west of the northeast corner of sec. 20, T. 17 N., R. 6 W.

O—2 inches to 0; forested litter of partially decomposed needles and twigs.

E—0 to 13 inches; light yellowish brown (10YR 6/4) extremely stony sandy loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; soft very friable, slightly sticky, nonplastic; common very fine, fine, and medium roots; many very fine tubular and interstitial pores; 25 percent stones and 40 percent cobbles; moderately acid; clear smooth boundary.

E/Bw—13 to 60 inches; 90 percent light gray (10YR 7/2) very cobbly sandy loam, brown (10YR 5/3) moist (E part); 10 percent light brown (7.5YR 6/4) very cobbly sandy loam, dark brown (7.5YR 4/4) moist (B part); weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine and few medium roots to 40 inches and few below; many very fine tubular and interstitial pores; 30 percent cobbles and 25 percent pebbles; moderately acid.

Range in Characteristics

Soil temperature: 40 to 45 degrees F

E horizon

Hue: 7.5YR or 10YR
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Clay content: 5 to 15 percent
Content of rock fragments: 60 to 85 percent—10 to 25 percent stones; 20 to 40 percent cobbles; 20 to 35 percent pebbles
Reaction: pH 5.1 to 6.5

E/Bw horizon

Hue: 7.5YR or 10YR
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 to 4 or 6
Texture: Loam or sandy loam
Clay content: 10 to 25 percent
Content of rock fragments: 60 to 85 percent—30 to 40 percent stones and cobbles; 25 to 45 percent pebbles
Reaction: pH 5.1 to 6.5

90F—Elve extremely stony sandy loam, 25 to 60 percent slopes

Setting

Landform: Mountains
Slope: 25 to 60 percent
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Elve and similar soils: 85 percent

Minor Components
Soils that are shallow to bedrock: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Areas of rubble land: 0 to 5 percent

Major Component Description

Surface layer texture: Extremely stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.0 inches

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

Management

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

Endoaquolls

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained or very poorly drained
Permeability: Variable
Landform: Flood plains and closed depressions
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 4,500 to 5,000 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Endoaquolls

Typical Pedon

Endoaquolls, in an area of Fluvaquents-Endoaquolls complex, 0 to 4 percent slopes, in an area of rangeland, 1,700 feet north and 50 feet east of the southwest corner of sec. 14, T. 24 N., R. 9 W.

A—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; slightly effervescent; slightly alkaline; clear smooth boundary.

Bg1—7 to 10 inches; dark grayish brown (10YR 4/2) silt loam, gray (10YR 6/1) dry; common medium distinct mottles yellowish brown (10YR 5/4) moist; moderate thin platy parting to moderate medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; many very fine tubular and interstitial pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bg2—10 to 14 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; common medium prominent mottles, strong brown (7.5YR 4/6) moist; massive; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; slightly alkaline; clear smooth boundary.

Bg3—14 to 22 inches; gray (5Y 5/1) loam, light gray (2.5Y 7/2) dry; common medium prominent mottles, brown (7.5YR 5/4) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; slightly alkaline; clear smooth boundary.

C—22 to 60 inches; dark brown (10YR 4/3) extremely gravelly sand, light brownish gray (10YR 6/2) dry; single grain; loose, nonsticky, nonplastic; 5 percent cobbles and 60 percent pebbles; slightly alkaline.

Range in Characteristics

Control section: 10 to 40 inches
Depth to the seasonal high water table: 0 to 24 inches

Fairfield Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Alluvial fans and moraines
Parent material: Alluvium or alpine till
Slope range: 1 to 25 percent
Elevation range: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Fairfield cobbly loam, 1 to 4 percent slopes, in an area of rangeland, 1,850 feet south and 2,450 feet west of the northeast corner of sec. 32, T. 17 N., R. 4 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 15 percent cobbles and 5 percent pebbles; neutral; clear smooth boundary.

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

Btk—10 to 15 inches; pale brown (10YR 6/3) gravelly clay loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; few distinct clay films on faces of peds; common distinct lime coats on faces of peds; 5 percent angular cobbles and 15 percent angular pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—15 to 25 inches; white (10YR 8/2) cobbly clay loam, pale brown (10YR 6/3) moist; weak coarse prismatic parting to weak medium and coarse subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 15 percent angular cobbles and 10 percent angular pebbles; disseminated lime; common distinct lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—25 to 40 inches; white (10YR 8/2) gravelly clay loam, pale brown (10YR 6/3) moist; weak coarse prismatic parting to weak coarse subangular blocky structure; hard, friable, moderately sticky,

slightly plastic; few very fine roots; many very fine tubular and interstitial pores; 5 percent angular cobbles and 15 percent angular pebbles; disseminated lime; common distinct lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—40 to 60 inches; very pale brown (10YR 8/3) gravelly clay loam, pale brown (10YR 6/3) moist; massive; hard, friable, moderately sticky, moderately plastic; few very fine roots; common very fine tubular and interstitial pores; 10 percent angular cobbles and 15 percent angular pebbles; disseminated lime; common soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 10 inches
Depth to the calcic horizon: 7 to 10 inches

A horizon
Hue: 10YR or 7.5YR
Value: 3 or 4 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 20 to 27 percent
Content of rock fragments: 15 to 35 percent—10 to 15 percent stones and cobbles; 5 to 20 percent pebbles
Reaction: pH 6.6 to 8.4

Bt horizon
Hue: 2.5Y, 10YR, or 7.5YR
Value: 4 or 5 dry; 3 or 4 moist
Chroma: 2 or 3
Texture: Clay loam or silty clay loam
Clay content: 30 to 35 percent
Electrical conductivity: 0 to 2 mmhos/cm
Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles
Reaction: pH 6.6 to 8.4

Btk and Bk1 horizons
Hue: 2.5Y, 10YR, or 7.5YR
Value: 5 to 8 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Clay loam or silty clay loam
Clay content: 27 to 32 percent
Content of rock fragments: 0 to 35 percent—0 to 2 percent cobbles; 0 to 15 percent pebbles
Electrical conductivity: 2 to 4 mmhos/cm
Calcium carbonate equivalent: 15 to 35 percent
Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons
Hue: 2.5Y, 10YR, or 7.5YR
Value: 6 to 8 dry; 5 to 7 moist
Chroma: 2 to 4
Texture: Clay loam or silty clay loam
Clay content: 27 to 32 percent
Content of rock fragments: 0 to 35 percent—0 to 15 percent cobbles; 0 to 20 percent pebbles
Calcium carbonate equivalent: 10 to 30 percent
Electrical conductivity: 2 to 4 mmhos/cm
Reaction: pH 7.4 to 8.4

42B—Fairfield cobbly loam, 1 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 1 to 4 percent
Elevation: 4,000 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Fairfield and similar soils: 85 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 4 percent
Soils with calcareous surface layers: 0 to 4 percent
Soils with more rock fragments: 0 to 4 percent
Soils with loam surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

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

Management

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

643D—Fairfield-Beanlake-Winspect stony loams, 2 to 25 percent slopes

Setting

Landform:
- Fairfield—Moraines
- Beanlake—Moraines
- Winspect—Moraines

Position on landform:
- Fairfield—Footslopes and toeslopes
- Beanlake—Backslopes
- Winspect—Backslopes and shoulders

Slope:
- Fairfield—2 to 25 percent
- Beanlake—2 to 25 percent
- Winspect—2 to 25 percent

Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Fairfield and similar soils: 45 percent
Beanlake and similar soils: 25 percent
Winspect and similar soils: 15 percent

Minor Components
Regent and similar soils: 0 to 4 percent
Poorly drained soils: 0 to 1 percent
Moderately deep soils: 0 to 4 percent
Very deep noncalcareous soils: 0 to 4 percent
Soils with more rock fragments: 0 to 2 percent

Major Component Description

Fairfield
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

Beanlake
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.3 inches

Winspect
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
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.

Management

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

Fairway Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderate to a depth of 45 inches and rapid below
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,600 to 4,800 feet
Mean annual precipitation: 10 to 22 inches
Frost-free period: 70 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Fluvaquentic Haplustolls

Typical Pedon

Fairway silt loam, in an area of Meadowcreek-Fairway complex, 0 to 2 percent slopes, in an area of cropland, 2,100 feet north and 2,400 feet east of the southwest corner of sec. 15, T. 10 N., R. 3 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine granular structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine, medium, and coarse roots; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

A—8 to 15 inches; grayish brown (2.5Y 5/2) loam, very dark grayish brown (2.5Y 3/2) moist; weak medium prismatic parting to weak medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine, medium, and coarse roots; common very

fine tubular and interstitial pores; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk—15 to 30 inches; light olive gray (5Y 6/2) silt loam, olive gray (5Y 4/2) moist; weak medium prismatic parting to weak coarse subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine, medium, and coarse roots; common very fine tubular and interstitial pores; few fine seams and soft masses of lime; strongly effervescent; slightly alkaline; clear smooth boundary.

Bg—30 to 45 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; many fine and medium prominent reddish brown (5YR 4/4) moist redox concentrations; weak medium and coarse subangular blocky structure; hard, friable, moderately sticky, moderately plastic; slightly effervescent; neutral; diffuse wavy boundary.

2Cg—45 to 60 inches; light brownish gray (2.5Y 6/2) sand, dark grayish brown (2.5Y 4/2) moist; few fine and medium prominent dark brown (7.5YR 4/4) moist redox concentrations; single grain; loose, nonsticky, nonplastic; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 10 to 15 inches
Depth to sand, loamy sand, or very gravelly sand: 40 inches or more
Depth to the seasonal high water table: 24 to 42 inches

Ap horizon
- Hue: 10YR or 2.5Y
- Value: 2 or 3 moist; 4 or 5 dry
- Chroma: 1 or 2
- Clay content: 15 to 27 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Reaction: pH 6.6 to 7.8

A horizon
- Hue: 10YR or 2.5Y
- Value: 2 or 3 moist; 4 or 5 dry
- Chroma: 1 to 3
- Texture: Loam or silt loam
- Clay content: 18 to 27 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Effervescence: Slightly or strongly
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 6.6 to 7.8

Bk horizon
- Hue: 10YR or 2.5Y
- Value: 3 or 4 moist; 6 dry
- Chroma: 2 or 3
- Texture: Loam or silt loam
- Clay content: 18 to 27 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 6.6 to 7.8

Bg horizon
- Hue: 10YR or 2.5Y
- Value: 3 or 4 moist; 6 dry
- Chroma: 1 to 3
- Texture: Loam, silt loam, or silty clay loam with thin strata of sandy loam, loamy sand, and clay loam
- Clay content: 20 to 30 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Effervescence: Slightly or strongly
- Calcium carbonate equivalent: 2 to 10 percent
- Reaction: pH 6.6 to 7.8

2Cg horizon
- Hue: 2.5Y or 5Y
- Value: 3 or 4 moist; 6 dry
- Chroma: 1 or 2
- Texture: Sand, loamy sand, or sandy loam
- Clay content: 0 to 10 percent
- Content of rock fragments: 0 to 60 percent—0 to 5 percent cobbles; 0 to 55 percent pebbles
- Effervescence: Slightly or strongly
- Calcium carbonate equivalent: 0 to 5 percent
- Reaction: pH 6.6 to 7.8

3A—Fairway silt loam, cool, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 4,500 to 4,800 feet
Mean annual precipitation: 20 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Fairway and similar soils: 90 percent

Minor Components
Wabek and similar soils: 0 to 4 percent
Larry and similar soils: 0 to 3 percent
Soils with sand and gravel at 30 inches: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Available water capacity: Mainly 8.6 inches

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

Management

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

20A—Fairway silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 90 to 120 days

Composition

Major Components
Fairway and similar soils: 90 percent

Minor Components
Meadowcreek and similar soils: 0 to 5 percent
Villy and similar soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Available water capacity: Mainly 8.6 inches

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

Management

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

520A—Fairway-Villy silt loams, 0 to 2 percent slopes

Setting

Landform:
- Fairway—Flood plains
- Villy—Flood plains

Position on landform:
- Fairway—Microhighs
- Villy—Microlows

Slope:
- Fairway—0 to 2 percent
- Villy—0 to 2 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Fairway and similar soils: 45 percent
Villy and similar soils: 40 percent

Minor Components
Meadowcreek and similar soils: 0 to 5 percent
Very poorly drained soils: 0 to 5 percent
Soils that have slopes more than 2 percent: 0 to 5 percent

Major Component Description

Fairway
Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Available water capacity: Mainly 8.6 inches

Villy
Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained

Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Available water capacity: Mainly 11.4 inches

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

Management

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

Farnuf Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans and stream terraces
Parent material: Alluvium or glacial till
Slope range: 0 to 25 percent
Elevation range: 3,500 to 5,500 feet
Mean annual precipitation: 15 to 22 inches
Frost-free period: 70 to 110 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Farnuf loam, in an area of Farnuf-Reeder loams, 4 to 10 percent slopes, in an area of rangeland, 1,200 feet north and 1,500 feet west of the southeast corner of sec. 29 T. 19 N., R. 4 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy parting to weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; slightly acid; clear smooth boundary.

Bt1—5 to 9 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; 2 percent pebbles; slightly acid; gradual smooth boundary.

Bt2—9 to 14 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; strong medium prismatic parting to strong medium angular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous distinct very dark grayish brown (10YR 3/2) moist clay films on faces of peds; neutral; gradual smooth boundary.

Bt3—14 to 19 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; strong medium prismatic parting to strong medium angular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous distinct dark brown (10YR 3/3) moist clay films on faces of peds; neutral; gradual smooth boundary.

Btk—19 to 26 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; common fine soft masses and seams of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—26 to 38 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic parting to weak medium and coarse subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; many fine soft masses and seams of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—38 to 50 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; hard, friable, moderately sticky, slightly plastic; few very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; common fine soft masses and seams of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—50 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; hard, very friable, slightly sticky, slightly plastic; 5 percent pebbles; common fine soft masses and seams of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Depth to secondary lime: 10 to 25 inches

A horizon
Hue: 2.5Y or 10YR
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent
Content of rock fragments: 0 to 35 percent—0 to 20 percent stones and cobbles; 0 to 15 percent pebbles
Reaction: pH 6.1 to 7.8

Bt horizons
Hue: 2.5Y, 10YR, or 7.5YR
Value: 3 to 6 dry; 2 to 4 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or silty clay loam
Clay content: 25 to 35 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.1 to 7.8

Btk and Bk horizons
Hue: 2.5Y, 10YR, or 7.5YR
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loam, silt loam, silty clay loam, or clay loam
Clay content: 20 to 30 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

69A—Farnuf loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 2 percent
Elevation: 3,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Farnuf and similar soils: 85 percent

Minor Components
Soils with gravelly loam surface layers: 0 to 4 percent
Soils that have slopes more than 2 percent: 0 to 4 percent
Fairfield and similar soils: 0 to 4 percent
Soils with very gravelly substratums: 0 to 3 percent

Major Component Description

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

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

Management

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

69B—Farnuf loam, 2 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 4 percent
Elevation: 3,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Farnuf and similar soils: 85 percent

Minor Components
Soils with gravelly loam surface layers: 0 to 4 percent
Soils that have slopes more than 4 percent: 0 to 4 percent
Fairfield and similar soils: 0 to 4 percent
Soils with very gravelly substratums: 0 to 3 percent

Major Component Description

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

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

Management

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

69C—Farnuf loam, 4 to 10 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 10 percent
Elevation: 3,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Farnuf and similar soils: 90 percent

Minor Components
Soils with gravelly loam surface layers: 0 to 4 percent
Soils that have slopes more than 10 percent: 0 to 4 percent
Soils with very gravelly substratums: 0 to 2 percent

Major Component Description

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

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

Management

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

169C—Farnuf-Reeder loams, 4 to 10 percent slopes

Setting

Landform:
- Farnuf—Alluvial fans
- Reeder—Hills

Slope:
- Farnuf—4 to 10 percent
- Reeder—4 to 10 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Farnuf and similar soils: 70 percent
Reeder and similar soils: 20 percent

Minor Components
Regent and similar soils: 0 to 4 percent
Work and similar soils: 0 to 3 percent
Soils that have slopes more than 10 percent: 0 to 3 percent

Major Component Description

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

Reeder
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

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

Management

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

499D—Farnuf-Hilger stony loams, cool, 4 to 25 percent slopes

Setting

Landform:
- Farnuf—Alluvial fans
- Hilger—Moraines

Position on landform:
- Farnuf—Backslopes and footslopes
- Hilger—Backslopes and shoulders

Slope:
- Farnuf—4 to 25 percent
- Hilger—4 to 25 percent

Elevation: 4,500 to 5,000 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Farnuf and similar soils: 70 percent
Hilger and similar soils: 25 percent

Minor Components
Soils that have slopes more than 25 percent: 0 to 3 percent
Soils that are poorly drained and ponded: 0 to 1 percent
Soils with sand and gravel at 30 inches: 0 to 1 percent

Major Component Description

Farnuf
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.0 inches

Hilger
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
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.

Management

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

Fluvaquentic Haplustolls

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderately rapid to moderately slow; rapid in extremely gravelly sand
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 19 inches
Frost-free period: 90 to 120 days

Taxonomic Class: Fluvaquentic Haplustolls

Typical Pedon

Fluvaquentic Haplustolls, in an area of Typic Ustifluvents-Fluvaquentic Haplustolls complex, 0 to 4 percent slopes, in an area of rangeland, 1,850 feet north and 10 feet west of the southeast corner of sec. 2, T. 17 N., R. 4 W.

A—0 to 11 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; common worm casts; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bw—11 to 24 inches; light brownish gray (2.5Y 6/2) loam, with thin strata of sandy loam and silt loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bg1—24 to 40 inches; light brownish gray (2.5Y 6/2) loam with thin strata of silt loam and sandy loam, dark grayish brown (2.5Y 4/2) moist; common fine prominent dark brown (7.5YR 4/4) moist redox concentrations; massive; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; disseminated lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

Bg2—40 to 60 inches; light olive gray (5Y 6/2) sandy loam, dark gray (5Y 4/1) moist; common prominent dark brown (7.5YR 4/4) moist redox concentrations; massive; soft, very friable, slightly sticky, slightly plastic; few very fine roots; disseminated lime; strongly effervescent; strongly alkaline.

Range in Characteristics

Thickness of the mollic epipedon: 7 to 16 inches
Depth to the seasonal high water table: 24 to 42 inches
Depth to sand and gravel: 20 inches or more

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

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

Bg horizons
Texture: Loam to extremely gravelly sand

Fluvaquents

Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly or poorly drained
Permeability: Variable
Landform: Low stream terraces, closed depressions, and flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 3,500 to 5,000 feet
Mean annual precipitation: 10 to 25 inches
Frost-free period: 70 to 120 days

Taxonomic Class: Fluvaquents

Typical Pedon

Fluvaquents, in an area of Fluvaquents-Endoaquolls complex, 0 to 4 percent slopes, in an area of rangeland, 1,000 feet south and 50 feet west of the northeast corner of sec. 24, T. 15 N., R. 7 W.

Oi—3 inches to 0; very dark grayish brown (10YR 3/2) organic mat, grayish brown (10YR 5/2) dry; clear smooth boundary.
A—0 to 4 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; many fine prominent strong brown (7.5YR 5/6) moist redox concentrations in the lower part; weak very thin platy parting to weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; slightly acid; clear smooth boundary.
Bg1—4 to 8 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; many medium distinct dark brown (10YR 4/3) moist redox concentrations; moderate very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few medium roots; many very fine tubular and interstitial pores; slightly acid; clear smooth boundary.
Bg2—8 to 16 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; common medium distinct dark brown (7.5YR 3/4) moist redox concentrations; weak medium prismatic parting to weak medium and coarse subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few medium roots; many very fine tubular and interstitial pores; slightly acid; gradual smooth boundary.
Cg1—16 to 40 inches; dark gray (10YR 4/1) silt loam with thin strata of loam, gray (10YR 6/1) dry; common fine and medium prominent strong brown (7.5YR 5/6) moist redox concentrations; massive; slightly hard, very friable, moderately sticky, slightly plastic; common fine and few medium roots; common very fine tubular and interstitial pores; neutral; gradual smooth boundary.
2Cg2—40 to 60 inches; gray (10YR 5/1) gravelly loam, gray (10YR 6/1) dry; common fine and medium prominent strong brown (7.5YR 5/6) moist redox concentrations; massive; slightly hard, very friable, slightly sticky, nonplastic; few fine and medium roots; common very fine tubular and interstitial pores; 25 percent pebbles; neutral.

Range in Characteristics

Control section: 10 to 40 inches
Depth to the seasonal high water table: 0 to 24 inches
Control section texture: Silty clay to very gravelly sandy loam; some pedons may have extremely gravelly sand below a depth of 20 inches.
Salinity: Nonsaline to strongly saline
Sodicity: Nonsodic to moderately sodic
Soil phases: Saline

A horizon
Texture: Silt loam, loam, or silty clay

201B—Fluvaquents, saline, 0 to 4 percent slopes

Setting

Landform: Flood plains
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components
Fluvaquents, saline and similar soils: 75 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 5 percent
Well drained soils: 0 to 5 percent
Moderately well drained soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Slightly saline soils: 0 to 3 percent
Nonsaline and nonsodic soils: 0 to 2 percent

Major Component Description

Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare

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

Management

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

501B—Fluvaquents-Fluvaquentic Haplustolls complex, 0 to 4 percent slopes

Setting

Landform:
- Fluvaquents—Flood plains
- Fluvaquentic Haplustolls—Flood plains

Slope:
- Fluvaquents—0 to 4 percent
- Fluvaquentic Haplustolls—0 to 4 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components
Fluvaquents and similar soils: 60 percent
Fluvaquentic Haplustolls and similar soils: 30 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 2 percent
Soils that are shallow to sand and gravel: 0 to 2 percent
Well drained soils: 0 to 2 percent
Soils with gravelly sandy loam surfaces: 0 to 2 percent
Soils with cobbly sandy loam surfaces: 0 to 2 percent

Major Component Description

Fluvaquents
Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional

Fluvaquentic Haplustolls
Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare

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

Management

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

701B—Fluvaquents-Endoaquolls complex, 0 to 4 percent slopes

Setting

Landform:
- Fluvaquents—Flood plains
- Endoaquolls—Flood plains

Slope:
- Fluvaquents—0 to 4 percent
- Endoaquolls—0 to 4 percent

Elevation: 4,500 to 5,000 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Fluvaquents and similar soils: 50 percent
Endoaquolls and similar soils: 35 percent

Minor Components
Very poorly drained soils: 0 to 8 percent
Soils with organic surface layers: 0 to 7 percent

Major Component Description

Fluvaquents
Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Flooding: Occasional

Endoaquolls
Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Flooding: Rare

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

Management

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

Frenchcreek Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 2 to 15 percent
Elevation range: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Aridic Haplustolls

Typical Pedon

Frenchcreek very gravelly loam, 2 to 15 percent slopes, in an area of rangeland, 2,000 feet north and 800 feet east of the southwest corner of sec. 29, T. 13 N., R. 3 W.

A—0 to 5 inches; grayish brown (10YR 5/2) very gravelly loam, very dark grayish brown (10YR 3/3) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 55 percent pebbles; slightly acid; clear smooth boundary.

Bw1—5 to 12 inches; brown (10YR 5/3) very gravelly loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 60 percent pebbles; slightly acid; gradual smooth boundary.

Bw2—12 to 26 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, dark brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, slightly sticky, nonplastic; common very fine roots; 70 percent pebbles; slightly acid; gradual smooth boundary.

C1—26 to 36 inches; pale brown (10YR 6/3) extremely gravelly loamy sand, dark brown (10YR 4/3) moist; single grain; loose, slightly sticky, nonplastic; few very fine roots; 80 percent pebbles; neutral; gradual smooth boundary.

C2—36 to 60 inches; very pale brown (10YR 7/4) extremely gravelly loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, moderately sticky, slightly plastic; 70 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches; may or may not include part of the Bw horizon

A horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 4 or 5 dry; 3 moist
Chroma: 2 or 3
Clay content: 15 to 25 percent
Content of rock fragments: 35 to 60 percent—0 to 5 percent cobbles; 35 to 55 percent angular pebbles
Reaction: pH 6.1 to 7.8

Bw1 horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 4 to 6 dry; 3 or 4 moist
Chroma: 3 or 4
Texture: Loam or sandy loam
Clay content: 15 to 25 percent
Content of rock fragments: 30 to 80 percent—0 to 15 percent stones and cobbles; 30 to 65 percent angular pebbles
Reaction: pH 6.1 to 7.8

Bw2 horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Sandy loam or loam
Clay content: 10 to 20 percent
Content of rock fragments: 35 to 75 percent—0 to 5 percent cobbles; 35 to 70 percent angular pebbles
Reaction: pH 6.1 to 7.8

C1 horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loamy sand or sandy loam
Clay content: 5 to 15 percent
Content of rock fragments: 50 to 80 percent—0 to 5 percent cobbles; 50 to 75 percent angular pebbles
Reaction: pH 6.6 to 7.8

C2 horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 6 or 7 dry; 4 or 5 moist

Chroma: 2 to 4
Texture: Loam or sandy loam
Clay content: 10 to 20 percent
Content of rock fragments: 60 to 80 percent—0 to 5 percent angular cobbles; 60 to 75 percent angular pebbles
Reaction: pH 6.6 to 7.8

288C—Frenchcreek very gravelly loam, 2 to 15 percent slopes

Setting

Landform: Stream terraces
Slope: 2 to 15 percent
Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Frenchcreek and similar soils: 90 percent

Minor Components
Soils with cobbly loam surface layers: 0 to 4 percent
Soils that have slopes more than 15 percent: 0 to 3 percent
Soils with lime accumulation at 30 inches: 0 to 3 percent

Major Component Description

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

Management

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

Geohrock Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow over moderately rapid
Landform: Stream terraces and alluvial fans
Parent material: Alluvium
Slope range: 2 to 25 percent
Elevation range: 3,600 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Aridic Haplustalfs

Typical Pedon

Geohrock gravelly loam, 2 to 8 percent slopes, in an area of rangeland, 1,200 feet south and 1,000 feet east of the northwest corner of sec. 8, T. 11 N., R. 4 W.

A—0 to 4 inches; pinkish gray (7.5YR 6/2) gravelly loam, dark brown (7.5YR 4/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine roots; 20 percent angular pebbles; slightly alkaline; clear smooth boundary.

Bt—4 to 10 inches; brown (10YR 5/3) gravelly clay loam, dark brown (7.5YR 4/3) moist; moderate medium prismatic parting to moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds and lining of pores; 30 percent angular pebbles; slightly alkaline; clear smooth boundary.

Btk—10 to 18 inches; brown (7.5YR 5/3) very gravelly loam, dark brown (7.5YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; few faint clay films on faces of peds; 40 percent angular pebbles; many soft masses of lime; continuous faint lime coats on pebbles; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bk1—18 to 24 inches; light brown (7.5YR 6/4) extremely gravelly loam, brown (7.5YR 5/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 60 percent angular pebbles; disseminated lime; continuous distinct lime casts on undersides of pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—24 to 40 inches; pale brown (10YR 6/3) extremely gravelly loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately

sticky, slightly plastic; common very fine roots; 70 percent angular pebbles; disseminated lime; continuous distinct lime casts on undersides of pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

C1—40 to 45 inches; pinkish gray (7.5YR 6/2) extremely gravelly loam, brown (7.5YR 5/2) moist; massive; slightly hard, friable, moderately sticky, slightly plastic; few very fine roots; 80 percent angular pebbles; disseminated lime; slightly effervescent; slightly alkaline; clear smooth boundary.

C2—45 to 60 inches; pinkish gray (7.5YR 6/2) extremely gravelly loam, brown (7.5YR 5/3) moist; massive; slightly hard, friable, moderately sticky, slightly plastic; 60 percent angular pebbles; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Btk or Bk horizon: 6 to 10 inches

A horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 18 to 27 percent
Content of rock fragments: 15 to 60 percent—0 to 30 percent cobbles; 15 to 30 percent pebbles or channers
Reaction: pH 6.6 to 7.8

Bt horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 4 to 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 27 to 35 percent
Content of rock fragments: 20 to 60 percent—0 to 10 percent cobbles; 20 to 50 percent pebbles
Reaction: pH 6.6 to 7.8

Btk horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 15 to 25 percent
Content of rock fragments: 25 to 55 percent—0 to 5 percent angular cobbles; 25 to 50 percent angular pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 8.4

Bk horizons
Hue: 5YR, 7.5YR, or 10YR
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Clay content: 10 to 25 percent
Content of rock fragments: 60 to 80 percent—0 to 5 percent cobbles; 60 to 75 percent pebbles
Calcium carbonate equivalent: 10 to 15 percent
Reaction: pH 7.9 to 8.4

C horizons
Hue: 5YR, 7.5YR, or 10YR
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Sandy loam or loam
Clay content: 10 to 25 percent
Content of rock fragments: 60 to 80 percent—0 to 10 percent cobbles; 60 to 70 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

89D—Geohrock channery loam, cool, 4 to 25 percent slopes

Setting

Landform: Alluvial fans
Slope: 4 to 25 percent
Elevation: 4,000 to 4,500 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Geohrock and similar soils: 85 percent

Minor Components
Tolex and similar soils: 0 to 5 percent
Soils that have slopes more than 25 percent: 0 to 5 percent
Soils with calcareous surface layers: 0 to 5 percent

Major Component Description

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

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

Management

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

163D—Geohrock-Tolman channery loams, 4 to 35 percent slopes

Setting

Landform:
- Geohrock—Alluvial fans
- Tolman—Hills

Slope:
- Geohrock—4 to 25 percent
- Tolman—4 to 35 percent

Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Geohrock and similar soils: 55 percent
Tolman and similar soils: 40 percent

Minor Components
Soils that have slopes more than 35 percent: 0 to 1 percent
Areas of rock outcrop: 0 to 1 percent
Crago and similar soils: 0 to 1 percent
Hauz and similar soils: 0 to 1 percent
Soils with less gravel: 0 to 1 percent

Major Component Description

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

Tolman
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
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.

Management

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

233C—Geohrock-Crago very cobbly loams, 2 to 8 percent slopes

Setting

Landform:
- Geohrock—Alluvial fans
- Crago—Alluvial fans

Slope:
- Geohrock—2 to 8 percent
- Crago—2 to 8 percent

Elevation: 3,600 to 4,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Geohrock and similar soils: 60 percent
Crago and similar soils: 30 percent

Minor Components
Soils that have slopes more than 8 percent: 0 to 5 percent
Soils that are shallow to sand and gravel: 0 to 5 percent

Major Component Description

Geohrock
Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.2 inches

Crago
Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
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.

Management

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

532B—Geohrock gravelly loam, 2 to 8 percent slopes

Setting

Landform: Stream terraces
Slope: 2 to 8 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Geohrock and similar soils: 85 percent

Minor Components
Crago and similar soils: 0 to 5 percent
Soils that have slopes more than 8 percent: 0 to 5 percent
Soils with sand and gravel at 20 inches: 0 to 5 percent

Major Component Description

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

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

Management

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

Gerdrum Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Very slow
Landform: Alluvial fans, stream terraces, and uplands
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, smectitic, frigid Torrertic Natrustalfs

Typical Pedon

Gerdrum clay loam, in an area of Gerdrum-Nobe-Yamacall complex, 0 to 4 percent slopes, in an area of rangeland, 1,500 feet south and 2,000 feet east of the northwest corner of sec. 36, T. 20 N., R. 4 W.

E—0 to 2 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; many unstained silt and sand grains; moderately alkaline; abrupt smooth boundary.

Btn—2 to 6 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic parting to strong medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; many unstained sand and silt grains on faces of peds; moderately alkaline; clear smooth boundary.

Btnk—6 to 12 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; strong medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; disseminated lime and few fine soft masses of lime; strongly effervescent; strongly alkaline; clear smooth boundary.

Bkny—12 to 26 inches; light brownish gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse angular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine tubular and interstitial pores; common fine seams and masses of gypsum; disseminated lime and few fine masses of lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

Bknyz—26 to 48 inches; pale olive (5Y 6/3) clay, olive (5Y 5/3) moist; massive; hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine tubular and interstitial pores; common fine seams of gypsum and other salts; disseminated lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

C—48 to 60 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; massive; hard, firm, moderately sticky, moderately plastic; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to gypsum: 10 to 28 inches

E horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Loam (clay loam when mixed to 7 inches)
Clay content: 27 to 40 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.6 to 7.8

Btn horizon
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay, silty clay, clay loam, 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
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 10 to 20; pedons with sodium adsorption ratio of less than 13 have more exchangeable magnesium plus sodium than calcium plus exchange acidity at pH 8.2.
Reaction: pH 7.4 to 9.0

Btnk horizon
Hue: 10YR, 2.5Y, or 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

Bkny and Bknyz horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 4 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Clay loam, sandy 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
Gypsum content: 1 to 5 percent
Reaction: pH 7.9 to 9.0

C horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 3 to 6 moist
Chroma: 1 to 4 (1 chroma is lithochromic.)
Texture: Sandy loam, loam, clay loam, sandy clay loam, or silty clay loam
Clay content: 10 to 35 percent
Content of rock fragments: 15 to 25 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Electrical conductivity: 8 to 16 mmhos/cm
Sodium adsorption ratio: 13 to 30
Gypsum content: 1 to 5 percent
Reaction: pH 7.9 to 9.0

16B—Gerdrum-Nobe-Yamacall complex, 0 to 4 percent slopes

Setting

Landform:
- Gerdrum—Alluvial fans
- Nobe—Alluvial fans
- Yamacall—Alluvial fans

Slope:
- Gerdrum—0 to 4 percent
- Nobe—0 to 4 percent
- Yamacall—0 to 4 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Gerdrum and similar soils: 60 percent
Nobe and similar soils: 15 percent
Yamacall and similar soils: 15 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 3 percent
Soils that are moderately deep to shale: 0 to 3 percent

Soils with sandstone at 20 to 40 inches: 0 to 2 percent
Poorly drained soils: 0 to 2 percent

Major Component Description

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.3 inches

Nobe
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 4.6 inches

Yamacall
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 9.7 inches

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

Management

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

Hanson Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium derived from limestone
Slope range: 8 to 45 percent
Elevation range: 6,000 to 7,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, carbonatic Calcic Haplocryolls

Typical Pedon

Hanson channery loam, 8 to 35 percent slopes, in an area of rangeland, 1,400 feet north and 700 feet east of the southwest corner of sec. 11, T. 11 N., R. 6 W.

A—0 to 9 inches; dark gray (10YR 4/1) channery loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy parting to moderate very fine and fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 20 percent channers; neutral; clear smooth boundary.
Bk1—9 to 30 inches; very pale brown (10YR 7/3) very channery loam, light yellowish brown (10YR 6/4) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 15 percent cobbles and 35 percent channers; continuous prominent lime casts on undersides of rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk2—30 to 40 inches; very pale brown (10YR 7/3) very channery loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; many very fine tubular and interstitial pores; 20 percent cobbles and 40 percent channers; common fine seams of lime, few soft decomposed limestone fragments and continuous distinct lime crusts on undersides of rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk3—40 to 60 inches; very pale brown (10YR 7/3) extremely stony loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; 25 percent stones, 25 percent cobbles, and 20 percent channers; disseminated lime; continuous distinct lime coats on rock fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 37 to 44 degrees F
Thickness of the mollic epipedon: 8 to 16 inches
Depth to the calcic horizon: 8 to 16 inches

A horizon
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 1 or 2
Clay content: 18 to 27 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent flagstones; 15 to 30 percent channers
Reaction: pH 6.6 to 7.8

Bk horizons
Hue: 7.5YR, 10YR, or 2.5Y
Value: 7 or 8 dry; 5 or 6 moist
Chroma: 2 to 4
Texture: Loam or clay loam
Clay content: 18 to 32 percent
Content of rock fragments: 35 to 80 percent—25 to 55 percent stones and cobbles; 10 to 25 percent pebbles or channers
Calcium carbonate equivalent: 30 to 40 percent in the less than 2-mm particle-size fraction; more than 40 percent in the less than 20-mm soil particle-size fraction
Reaction: pH 7.4 to 8.4

23E—Hanson channery loam, 8 to 35 percent slopes

Setting

Landform: Mountains
Slope: 8 to 35 percent
Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Hanson and similar soils: 85 percent

Minor Components
Soils with limestone at 20 to 40 inches: 0 to 5 percent
Soils that have slopes more than 35 percent: 0 to 5 percent
Soils with stony surface layers: 0 to 4 percent
Noncalcareous soils: 0 to 1 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.6 inches

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

Management

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

123E—Hanson-Starley channery loams, 15 to 45 percent slopes

Setting

Landform:
- Hanson—Mountains
- Starley—Mountains

Position on landform:
- Hanson—Backslopes
- Starley—Backslopes and shoulders

Slope:
- Hanson—15 to 45 percent
- Starley—15 to 45 percent

Elevation: 6,000 to 7,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Hanson and similar soils: 75 percent
Starley and similar soils: 20 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Moderately deep soils: 0 to 2 percent
Soils with less lime: 0 to 1 percent

Major Component Description

Hanson
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.6 inches

Starley
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone 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.

Management

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

Hauz Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains and hills
Parent material: Material derived from igneous and argillite bedrock
Slope range: 8 to 45 percent
Elevation range: 4,000 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Aridic Argiustolls

Typical Pedon

Hauz channery loam, in an area of Hauz-Sieben-Tolman channery loams, 8 to 45 percent slopes, in an area of rangeland, 1,400 feet south and 1,500 feet east of the northwest corner of sec. 3, T. 12 N., R. 5 W.

A—0 to 5 inches; brown (7.5YR 5/2) channery loam, dark brown (7.5YR 3/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine roots; 25 percent channers; slightly acid; clear smooth boundary.

Bt—5 to 15 inches; brown (7.5YR 5/4) very channery clay loam, reddish brown (5YR 4/3) moist; moderate medium prismatic parting to moderate very fine subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds and fragments; 45 percent channers; neutral; gradual smooth boundary.

BC—15 to 24 inches; brown (7.5YR 5/4) extremely channery loam, reddish brown (5YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; 70 percent channers; few faint clay films on faces of peds; neutral; gradual smooth boundary.

R—24 inches; hard fractured bedrock; few fine roots extending into vertical cracks in upper part; few faint lime coats on undersides of some rock fragments.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to bedrock: 20 to 40 inches

A horizon
Hue: 5YR, 7.5YR, or 10YR
Chroma: 2 or 3
Clay content: 15 to 25 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent flagstones; 15 to 30 percent channers
Reaction: pH 6.1 to 7.8

Bt horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 3 or 4
Clay content: 27 to 35 percent
Content of rock fragments: 50 to 85 percent—5 to 15 percent flagstones; 45 to 70 percent channers
Reaction: pH 6.1 to 7.8

BC horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Clay content: 10 to 25 percent
Content of rock fragments: 60 to 80 percent—10 to 20 percent flagstones; 50 to 60 percent channers
Reaction: pH 6.6 to 7.8

263E—Hauz-Sieben-Tolman channery loams, 8 to 45 percent slopes

Setting

Landform:
- Hauz—Mountains
- Sieben—Mountains
- Tolman—Mountains

Position on landform:
- Hauz—Backslopes
- Sieben—Backslopes and footslopes
- Tolman—Backslopes and shoulders

Slope:
- Hauz—8 to 45 percent
- Sieben—8 to 35 percent
- Tolman—8 to 45 percent

Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Hauz and similar soils: 35 percent
Sieben and similar soils: 30 percent
Tolman and similar soils: 25 percent

Minor Components
Mocmont and similar soils: 0 to 3 percent
Crago and similar soils: 0 to 3 percent
Soils that have slopes more than 45 percent: 0 to 2 percent
Areas of rock outcrop: 0 to 1 percent
Soils with less rock fragments: 0 to 1 percent

Major Component Description

Hauz
Surface layer texture: Channery loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.7 inches

Sieben
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

Tolman
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
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.

Management

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

Havre Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Flood plains and low stream terraces
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, calcareous, frigid Aridic Ustifluvents

Typical Pedon

Havre silt loam, 0 to 2 percent slopes, in an area of cropland, 2,200 feet south and 900 feet west of the northeast corner of sec. 1, T. 21 N., R. 7 W.

Ap—0 to 6 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky parting to weak very fine and fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

A—6 to 20 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic parting to weak medium and coarse subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine and few medium roots; many very fine tubular and interstitial pores; common worm casts and molds; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1—20 to 40 inches; light brownish gray (2.5Y 6/2) loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; common worm casts and molds; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—40 to 55 inches; light brownish gray (2.5Y 6/2) loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, moderately sticky, slightly plastic; few very fine and medium roots; common very fine tubular and interstitial pores; strongly effervescent; moderately alkaline; clear smooth boundary.

C3—55 to 60 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

A horizons
- Hue: 10YR or 2.5Y
- Value: 5 or 6 dry; 4 or 5 moist
- Chroma: 2 or 3
- Texture: Silt loam or silty clay
- Clay content: 15 to 55 percent
- Calcium carbonate equivalent: 1 to 5 percent
- Effervescence: None to strongly
- Electrical conductivity: 0 to 2 mmhos/cm
- Sodium adsorption ratio: 0 to 4
- Reaction: pH 6.1 to 8.4

C1 horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5 or 6 dry; 4 or 5 moist
- Chroma: 2 or 3
- Texture: Loam, silt loam, or clay loam, consisting of strata of silt loam, fine sandy loam, silty clay loam, or clay loam
- Clay content: 18 to 35 percent
- Calcium carbonate equivalent: 1 to 10 percent
- Effervescence: Slightly or strongly
- Electrical conductivity: 0 to 4 mmhos/cm
- Sodium adsorption ratio: 0 to 13
- Reaction: pH 7.4 to 9.0

C2 and C3 horizons
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5 or 6 dry; 4 or 5 moist
- Chroma: 2 or 3
- Texture: Loam, sandy loam, silt loam, or clay loam, consisting of strata of silt loam, fine sandy loam, silty clay loam, or clay loam
- Clay content: 18 to 35 percent
- Calcium carbonate equivalent: 1 to 10 percent
- Effervescence: Slightly or strongly
- Electrical conductivity: 0 to 4 mmhos/cm
- Sodium adsorption ratio: 0 to 13
- Reaction: pH 7.4 to 9.0

17A—Havre silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Havre and similar soils: 85 percent

Minor Components
Soils with sand and gravel substratums: 0 to 5 percent
Silty clay loam soils: 0 to 5 percent
Silty clay soils: 0 to 5 percent

Major Component Description

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

Management

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

217A—Havre silty clay, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,500 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Havre and similar soils: 85 percent

Minor Components
Soils with silty clay loam surface layers: 0 to 5 percent
Soils with sand and gravel at deep depths: 0 to 5 percent
Very deep clayey soils: 0 to 5 percent

Major Component Description

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

Flooding: Rare
Available water capacity: Mainly 9.4 inches

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

Management

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

Helmville Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Mountains
Parent material: Colluvium and alluvium derived from limestone, argillite, or igneous rock
Slope range: 15 to 60 percent
Elevation range: 5,000 to 7,000 feet
Mean annual precipitation: 19 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Eutric Haplocryalfs

Typical Pedon

Helmville channery loam, 25 to 60 percent slopes, in an area of forestland, 1,100 feet south and 200 feet west of the northeast corner of sec. 20, T. 16 N., R. 6 W.

Oi—2 inches to 0; forest litter of partially decomposed needles, twigs, and roots.
E1—0 to 5 inches; pinkish gray (7.5YR 6/2) channery loam, dark brown (7.5YR 4/3) moist; weak very thin platy parting to weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; many silt and sand skeletans on faces of peds; 20 percent channers; moderately acid; clear smooth boundary.
E2—5 to 10 inches; very pale brown (10YR 7/3) channery loam, yellowish brown (10YR 5/4) moist; weak very thin platy parting to weak very fine granular structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; 15 percent channers; moderately acid; gradual smooth boundary.
Bt—10 to 25 inches; light yellowish brown (10YR 6/4) very channery clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 10 percent angular cobbles and 50 percent channers; slightly alkaline; gradual smooth boundary.
Bk—25 to 60 inches; pale yellow (2.5Y 7/4) extremely cobbly loam, light olive brown (2.5Y 5/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; few very fine, fine, and medium roots; many very fine tubular and interstitial pores; 10 percent stones, 40 percent angular cobbles, and 15 percent channers; continuous distinct lime casts on undersides of rock fragments; disseminated lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 37 to 42 degrees F
Depth to the accumulation of carbonates: 15 to 40 inches
Soil phases: Channery and warm

E horizons
- Hue: 10YR or 7.5YR
- Value: 5 to 7 dry; 3 to 5 moist
- Chroma: 2 to 4
- Clay content: 18 to 27 percent
- Content of rock fragments, flat or subrounded: 15 to 35 percent—0 to 20 percent stones, flagstones, and cobbles; 5 to 30 percent pebbles or channers
- Reaction: pH 5.6 to 7.3

Bt horizon
- Hue: 10YR or 7.5YR
- Value: 4 to 6 dry; 3 to 5 moist
- Chroma: 4 or 6
- Clay content: 27 to 35 percent
- Content of rock fragments, flat or subrounded: 30 to 60 percent—10 to 35 percent stones and cobbles; 15 to 50 percent pebbles or channers
- Reaction: pH 6.1 to 7.8

Bk horizon
- Hue: 10YR or 2.5Y
- Value: 5 to 7 dry; 4 or 5 moist
- Chroma: 3, 4, or 6
- Texture: Loam, sandy loam, or clay loam
- Clay content: 18 to 30 percent

Content of rock fragments, flat or subrounded:
40 to 90 percent—15 to 45 percent stones and cobbles; 20 to 45 percent pebbles or channers
Calcium carbonate equivalent: 15 to 30 percent
Reaction: pH 7.4 to 8.4

196F—Helmville-Swiftcurrent complex, 25 to 60 percent slopes

Setting

Landform:
- Helmville—Mountains
- Swiftcurrent—Mountains

Position on landform:
- Helmville—Backslopes and shoulders
- Swiftcurrent—Backslopes

Slope:
- Helmville—25 to 60 percent
- Swiftcurrent—25 to 60 percent

Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Helmville and similar soils: 50 percent
Swiftcurrent and similar soils: 40 percent

Minor Components
Cowood and similar soils: 0 to 4 percent
Moderately deep soils: 0 to 3 percent
Soils that are shallow to lime: 0 to 3 percent

Major Component Description

Helmville
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

Swiftcurrent
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forestland
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.

Management

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

390F—Helmville channery loam, 25 to 60 percent slopes

Setting

Landform: Mountains
Slope: 25 to 60 percent
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Helmville and similar soils: 85 percent

Minor Components
Cowood and similar soils: 0 to 5 percent
Tigeron and similar soils: 0 to 5 percent
Moderately deep soils: 0 to 5 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

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

Management

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

590E—Helmville channery loam, warm, 15 to 30 percent slopes

Setting

Landform: Mountains
Slope: 15 to 30 percent

Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Helmville and similar soils: 85 percent

Minor Components
Moderately deep soils: 0 to 4 percent
Areas of rock outcrop: 0 to 4 percent
Soils that have slopes more than 30 percent: 0 to 4 percent
Soils that are shallow to lime: 0 to 3 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

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

Management

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

590F—Helmville channery loam, warm, 30 to 60 percent slopes

Setting

Landform: Mountains
Slope: 30 to 60 percent
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 20 to 24 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Helmville and similar soils: 85 percent

Minor Components
Moderately deep soils: 0 to 5 percent
Areas of rock outcrop: 0 to 5 percent
Soils that are shallow to lime: 0 to 5 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

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

Management

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

Hilger Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans and moraines
Parent material: Alluvium or alpine till
Slope range: 2 to 45 percent
Elevation range: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 25 inches
Frost-free period: 70 to 110 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Hilger stony loam, in an area of Hilger-Farnuf stony loams, 8 to 35 percent slopes, in an area of rangeland, 2,300 feet north and 2,400 feet west of the southeast corner of sec. 2, T. 9 N., R. 5 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 10 percent stones, 5 percent cobbles, and 5 percent pebbles; neutral; clear smooth boundary.

Bt1—6 to 10 inches; dark brown (10YR 4/3) very cobbly clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic parting to moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct very dark grayish brown (10YR 3/2) moist clay films on faces of peds; 20 percent cobbles and 20 percent pebbles; neutral; gradual smooth boundary.

Bt2—10 to 20 inches; yellowish brown (10YR 5/4) very cobbly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic parting to moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct very dark grayish brown (10YR 3/2) moist clay films on faces of peds; clay bridging of sand grains; 20 percent cobbles and 20 percent pebbles; neutral; gradual smooth boundary.

Btk—20 to 28 inches; light brown (7.5YR 6/4) very cobbly clay loam, brown (7.5YR 5/4) moist; moderate medium prismatic parting to moderate coarse subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; few faint clay films on faces of peds; 20 percent cobbles and 20 percent pebbles; common medium soft masses of lime; continuous distinct lime casts on undersides of rock fragments; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bk—28 to 50 inches; white (10YR 8/2) very cobbly loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; common very fine tubular and interstitial pores; 25 percent cobbles and 15 percent pebbles; common fine and medium soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

BC—50 to 60 inches; reddish yellow (7.5YR 6/6) very cobbly loam, brown (7.5YR 5/4) moist; massive; hard, friable, moderately sticky, slightly plastic; few very fine roots; 30 percent cobbles and 20 percent pebbles; few fine soft masses of white lime; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Thickness of the mollic epipedon: 7 to 14 inches
Depth to the calcic horizon: 13 to 24 inches
Soil phases: Very stony

A horizon
- Hue: 7.5YR or 10YR
- Value: 3 or 4 dry; 2 or 3 moist
- Clay content: 15 to 27 percent
- Content of rock fragments: 15 to 35 percent—10 to 35 percent boulders, stones, and cobbles; 5 to 25 percent pebbles
- Content of rock fragments, surface area: 0.01 to 3 percent boulders and stones
- Reaction: pH 6.6 to 7.8

Bt horizons
- Hue: 7.5YR, 10YR, or 2.5Y
- Value: 4 or 5 dry; 3 or 4 moist
- Chroma: 2 to 4
- Texture: Loam, clay loam, or sandy clay loam
- Clay content: 25 to 35 percent
- Content of rock fragments: 35 to 80 percent—35 to 60 percent boulders, stones, and cobbles; 10 to 30 percent pebbles
- Reaction: pH 7.4 to 8.4

Btk and Bk horizons
- Hue: 2.5Y, 10YR, or 7.5YR
- Value: 5 to 8 dry; 4 to 6 moist
- Chroma: 2 to 4
- Texture: Loam, sandy loam, or clay loam
- Clay content: 15 to 35 percent
- Content of rock fragments: 35 to 85 percent—25 to 70 percent boulders, stones, and cobbles; 15 to 35 percent pebbles
- Calcium carbonate equivalent: 15 to 30 percent
- Reaction: pH 7.9 to 8.4

BC horizon
- Hue: 7.5YR, 10YR, or 2.5Y
- Value: 5 to 7 dry; 4 to 6 moist
- Chroma: 2 to 4, 6
- Texture: Loam, sandy loam, or clay loam
- Clay content: 15 to 30 percent
- Content of rock fragments: 35 to 80 percent—25 to 70 percent boulders, stones, and cobbles; 15 to 35 percent pebbles
- Reaction: pH 7.9 to 8.4

100E—Hilger extremely stony loam, 8 to 45 percent slopes

Setting

Landform: Mountains
Slope: 8 to 45 percent
Elevation: 4,500 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Hilger and similar soils: 85 percent

Minor Components
Farnuf and similar soils: 0 to 5 percent
Soils with stony surface layers: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Areas of rubble land: 0 to 2 percent

Soils with sand and gravel at 30 inches: 0 to 2 percent
Poorly drained soils: 0 to 2 percent

Major Component Description

Surface layer texture: Extremely stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches

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

Management

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

567B—Hilger stony loam, 2 to 8 percent slopes

Setting

Landform: Stream terraces
Slope: 2 to 8 percent
Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 105 days

Composition

Major Components
Hilger and similar soils: 85 percent

Minor Components
Soils that have slopes more than 8 percent: 0 to 5 percent
Soils with sand and gravel at 30 inches: 0 to 5 percent
Soils that are calcareous throughout: 0 to 5 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.8 inches

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

Management

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

567D—Hilger-Farnuf stony loams, 8 to 35 percent slopes

Setting

Landform:
- Hilger—Alluvial fans
- Farnuf—Alluvial fans

Slope:
- Hilger—8 to 35 percent
- Farnuf—8 to 25 percent

Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Hilger and similar soils: 45 percent
Farnuf and similar soils: 40 percent

Minor Components
Soils shallow to bedrock: 0 to 5 percent
Soils with very stony surface layers: 0 to 5 percent
Soils that are calcareous throughout: 0 to 5 percent

Major Component Description

Hilger
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.8 inches

Farnuf
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.0 inches

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

Management

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

961E—Hilger-Regent-Castner stony loams, 15 to 35 percent slopes

Setting

Landform:
- Hilger—Hills
- Regent—Hills
- Castner—Hills

Position on landform:
- Hilger—Backslopes and footslopes
- Regent—Backslopes
- Castner—Backslopes and shoulders

Slope:
- Hilger—15 to 35 percent
- Regent—15 to 35 percent
- Castner—15 to 35 percent

Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Hilger and similar soils: 40 percent
Regent and similar soils: 35 percent
Castner and similar soils: 20 percent

Minor Components
Reeder and similar soils: 0 to 1 percent
Cabba and similar soils: 0 to 1 percent
Areas of rock outcrop: 0 to 1 percent
Very shallow soils: 0 to 1 percent
Shallow clayey soils: 0 to 1 percent

Major Component Description

Hilger
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.9 inches

Regent
Surface layer texture: Stony loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Castner
Surface layer texture: Stony loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
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.

Management

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

Holter Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and mountains
Parent material: Colluvium derived from igneous and argillite bedrock
Slope range: 8 to 45 percent
Elevation range: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Holter channery loam, in an area of Holter-Castner channery loams, 8 to 45 percent slopes, in an area of rangeland, 600 feet south and 700 feet west of the northeast corner of sec. 2, T. 13 N., R. 5 W.

A1—0 to 8 inches; dark grayish brown (10YR 4/2) channery loam, very dark grayish brown (10YR

3/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and few fine roots; many very fine tubular and interstitial pores; 20 percent channers; moderately acid; gradual smooth boundary.

A2—8 to 12 inches; brown (10YR 5/3) very channery loam, dark brown (10YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine and few fine roots; many very fine tubular and interstitial pores; 55 percent channers; moderately acid; gradual smooth boundary.

Bt1—12 to 28 inches; yellowish brown (10YR 5/4) extremely channery clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and few fine roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; 65 percent channers; slightly acid; gradual smooth boundary.

Bt2—28 to 42 inches; brown (10YR 5/3) extremely channery clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine tubular and interstitial pores; common distinct clay films on faces of peds and clay bridging of sands; 65 percent channers; slightly acid; clear smooth boundary.

Bk—42 to 60 inches; brown (10YR 5/3) extremely channery loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and few fine roots to 50 inches and few very fine roots below; many very fine tubular and interstitial pores; 60 percent channers; continuous faint lime casts on undersides of rock fragments; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Depth to the Bk horizon: 25 to 50 inches

A1 horizon
Hue: 7.5YR or 10YR
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 15 to 25 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent flagstones; 15 to 30 percent channers
Reaction: pH 5.6 to 7.3

A2 horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 4 or 5 dry; 3 moist
Chroma: 2 or 3
Clay content: 18 to 27 percent
Content of rock fragments: 40 to 65 percent—0 to 5 percent flagstones; 40 to 60 percent channers
Reaction: pH 5.6 to 7.3

Bt horizons
Hue: 5YR, 7.5YR, or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 3 or 4
Texture: Loam or clay loam
Clay content: 25 to 35 percent
Content of rock fragments: 60 to 80 percent—5 to 10 percent flagstones; 55 to 75 percent channers
Reaction: pH 6.1 to 7.3

Bk horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4 or 6
Texture: Loam or sandy clay loam
Clay content: 10 to 25 percent
Content of rock fragments: 60 to 80 percent—5 to 10 percent flagstones; 55 to 75 percent channers
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

61E—Holter-Castner channery loams, 8 to 45 percent slopes

Setting

Landform:
- Holter—Hills
- Castner—Hills

Position on landform:
- Holter—Backslopes and footslopes
- Castner—Backslopes and shoulders

Slope:
- Holter—8 to 45 percent
- Castner—8 to 45 percent

Elevation: 4,500 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Holter and similar soils: 60 percent
Castner and similar soils: 25 percent

Minor Components
Mocmont and similar soils: 0 to 5 percent
Soils that have slopes more than 45 percent: 0 to 3 percent
Areas of rock outcrop: 0 to 3 percent
Very shallow soils: 0 to 2 percent
Moderately deep soils: 0 to 2 percent

Major Component Description

Holter
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

Castner
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
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.

Management

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

Kalsted Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Alluvial fans and bedrock-floored plains
Parent material: Alluvium
Slope range: 2 to 8 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Aridic Calciustepts

Typical Pedon

Kalsted sandy loam, in an area of Kalsted-Chinook sandy loams, 2 to 8 percent slopes, in an area of rangeland, 1,900 feet north and 1,600 feet west of the southeast corner of sec. 31, T. 11 N., R. 1 W.

A—0 to 3 inches; grayish brown (10YR 5/2) sandy loam, dark brown (10YR 4/3) moist; weak very fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine roots; mildly alkaline; clear smooth boundary.
Bw—3 to 5 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky, nonplastic; many very fine roots; many very fine tubular and interstitial pores; slightly alkaline; clear smooth boundary.
Bk1—5 to 12 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; continuous faint lime casts on undersides of pebbles; disseminated lime; common distinct lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk2—12 to 36 inches; very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) moist; weak medium and coarse prismatic parting to weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; continuous distinct lime coats on pebbles; disseminated lime; many distinct lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk3—36 to 60 inches; very pale brown (10YR 7/3) gravelly fine sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky, slightly plastic; few very fine roots; 25 percent pebbles; disseminated lime; continuous distinct lime coats on pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the Bk horizon: 5 to 12 inches
Soil phases: Bedrock substratum

A horizon
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 5 to 18 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bw horizon
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Sandy loam or loamy sand
Clay content: 5 to 18 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bk1 horizon
Value: 6 to 8 dry; 5 to 7 moist
Chroma: 2 or 3
Texture: Fine sandy loam or sandy loam with thin strata of loam, very fine sandy loam, and silt loam (more than 50 percent fine and coarser sand)
Clay content: 5 to 18 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 15 to 30 percent
Reaction: pH 7.4 to 8.4

Bk2 and Bk3 horizons
Value: 6 to 8 dry; 5 to 7 moist
Chroma: 2 to 4
Texture: Fine sandy loam or sandy loam stratified with more than 50 percent fine and coarser sand
Clay content: 5 to 15 percent
Content of rock fragments: 5 to 35 percent—0 to 5 percent cobbles; 5 to 30 percent pebbles
Calcium carbonate equivalent: 15 to 30 percent
Reaction: pH 7.9 to 8.4

236B—Kalsted-Chinook sandy loams, 2 to 8 percent slopes

Setting

Landform:
- Kalsted—Alluvial fans
- Chinook—Alluvial fans

Slope:
- Kalsted—2 to 8 percent
- Chinook—2 to 8 percent

Elevation: 3,500 to 4,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Kalsted and similar soils: 50 percent
Chinook and similar soils: 40 percent

Minor Components
Soils that are very gravelly throughout: 0 to 4 percent
Soils that are very gravelly at 2 feet: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 3 percent

Major Component Description

Kalsted
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 5.5 inches

Chinook
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 7.2 inches

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

Management

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

Kobase Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,500 to 4,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, smectitic, frigid Torrertic Haplustepts

Typical Pedon

Kobase silty clay, 0 to 2 percent slopes, in an area of cropland, 800 feet north and 2,500 feet east of the southwest corner of sec. 4, T. 15 N., R. 3 W.

Ap1—0 to 3 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate very fine granular structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Ap2—3 to 8 inches; light brownish gray (10YR 6/2) silty clay, dark grayish brown (10YR 4/2) moist; weak medium and coarse angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine tubular and interstitial pores; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bw—8 to 12 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; weak medium and coarse angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; slightly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—12 to 36 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (10YR 4/2) moist; weak medium prismatic parting to weak medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; few faint seams of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bky—36 to 60 inches; gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; few medium brown (7.5YR 5/4) moist mottles; weak medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine tubular and interstitial pores; common distinct seams and soft masses of lime; few seams of gypsum; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 12 to 17 inches
Depth to the Bky horizon: 20 to 40 inches

Ap horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 40 to 45 percent
Content of rock fragments: 0 to 5 percent pebbles
Electrical conductivity: 0 to 2 mmhos/cm
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 6.6 to 8.4

Bw horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 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: 0 to 10 percent
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

Bk1 horizon
Hue: 10YR, 2.5Y, or 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
Electrical conductivity: 0 to 2 mmhos/cm
Reaction: pH 7.4 to 8.4

Bky horizon
Hue: 10YR, 2.5Y, or 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
Electrical conductivity: 0 to 4 mmhos/cm
Gypsum content: 1 to 5 percent
Reaction: pH 7.9 to 9.0

130A—Kobase silty clay, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 3,500 to 4,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Kobase and similar soils: 95 percent

Minor Components
Soils with sand and gravel substratums: 0 to 5 percent

Major Component Description

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

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

Management

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

Korell Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Low stream terraces and flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,500 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Fluventic Haplustolls

Typical Pedon

Korell loam, 0 to 2 percent slopes, protected, in an area of cropland, 1,100 feet north and 50 feet east of the southwest corner of sec. 11, T. 15 N., R. 3 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; slightly effervescent; slightly alkaline; abrupt smooth boundary.

A—6 to 9 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; slightly effervescent; slightly alkaline; clear smooth boundary.

Bw—9 to 24 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 3/2) moist; weak medium and coarse angular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; strongly effervescent; strongly alkaline; clear smooth boundary.

C1—24 to 34 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, friable, moderately sticky, slightly plastic; few very fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; strongly alkaline; clear smooth boundary.

C2—34 to 60 inches; light brownish gray (2.5Y 6/2) stratified silt loam and loam, grayish brown (2.5Y 5/2) moist; few fine distinct strong brown (7.5YR 5/6) redox concentrations; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular and interstitial pores; few fine seams and soft masses of lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Other features: The organic carbon decreases irregularly with depth.

A horizons
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 1 or 2
Clay content: 18 to 27 percent
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 7.4 to 7.8

Bw horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 to 5 moist
Chroma: 2 or 3
Texture: Loam or silt loam
Clay content: 18 to 27 percent
Sodium adsorption ratio: 5 to 13
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

C horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Loam, fine sandy loam, or silt loam

Clay content: 18 to 27 percent
Calcium carbonate equivalent: 5 to 15 percent
Sodium adsorption ratio: 5 to 13
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.9 to 9.0

12A—Korell loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,500 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Korell and similar soils: 95 percent

Minor Components
Fairway and similar soils: 0 to 2 percent
Very deep sandy loam soils: 0 to 2 percent
Soils with sand and gravel at 30 inches: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 10.2 inches

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

Management

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

112A—Korell loam, 0 to 2 percent slopes, protected

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 3,500 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Korell and similar soils: 95 percent

Minor Components
Fairway and similar soils: 0 to 2 percent
Very deep sandy loam soils: 0 to 2 percent
Soils with sand and gravel at 50 inches: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.2 inches

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

Management

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

LF—Landfill

Composition

Major Components
Landfill: 100 percent

Major Component Description

Definition: Areas where refuse is processed and buried.

Lap Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains and hills
Parent material: Material derived from limestone
Slope range: 8 to 45 percent
Elevation range: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid Lithic Calciustolls

Typical Pedon

Lap channery loam, in an area of Windham-Lap channery loams, 8 to 45 percent slopes, in an area of rangeland, 2,400 feet south and 300 feet west of the northeast corner of sec. 29, T. 12 N., R. 5 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) channery loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy parting to moderate very fine and fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 25 percent channers; slightly alkaline; clear smooth boundary.

Bk1—6 to 8 inches; grayish brown (10YR 5/2) very channery loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; 30 percent channers; disseminated lime; continuous distinct lime casts on undersides of channers; strongly effervescent; strongly alkaline; clear smooth boundary.

Bk2—8 to 14 inches; very pale brown (10YR 7/3) extremely channery loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 65 percent channers; disseminated lime; continuous prominent lime casts on undersides of channers; violently effervescent; moderately alkaline; abrupt wavy boundary.

R—14 inches; hard limestone bedrock with few cracks.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the R horizon: 10 to 20 inches

A horizon
- Hue: 10YR or 2.5Y
- Value: 4 or 5 dry; 2 or 3 moist
- Chroma: 2 or 3
- Clay content: 15 to 25 percent
- Content of rock fragments: 15 to 35 percent—0 to 5 percent flagstones; 15 to 30 percent channers
- Calcium carbonate equivalent: 0 to 15 percent in the less than 2-mm particle-size fraction; more than 40 percent in the less than 20-mm particle-size class
- Reaction: pH 6.6 to 7.8

Bk1 horizon
- Hue: 7.5YR, 10YR, or 2.5Y
- Value: 5 to 7 dry; 4 or 5 moist
- Chroma: 2 or 3
- Texture: Loam or clay loam
- Clay content: 20 to 30 percent
- Content of rock fragments: 35 to 70 percent—0 to 30 percent stones, flagstones, or cobbles; 30 to 55 percent pebbles or channers
- Calcium carbonate equivalent: 40 to 60 percent
- Reaction: pH 7.9 to 8.4

Bk2 horizon
- Hue: 7.5YR, 10YR, or 2.5Y
- Value: 6 to 8 dry; 5 or 6 moist
- Chroma: 2 or 3
- Texture: Loam or clay loam
- Clay content: 20 to 30 percent
- Content of rock fragments: 50 to 70 percent—25 to 35 percent stones, flagstones, or cobbles; 35 to 60 percent pebbles or channers
- Calcium carbonate equivalent: 40 to 60 percent
- Reaction: pH 7.9 to 8.4

264F—Lap-Windham-Rock outcrop complex, 15 to 45 percent slopes

Setting

Landform:
- Lap—Hills
- Windham—Hills

Position on landform:
- Lap—Backslopes and shoulders
- Windham—Backslopes and footslopes
- Rock outcrop—Backslopes and shoulders

Slope:
- Lap—15 to 45 percent
- Windham—15 to 45 percent

Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Lap and similar soils: 55 percent
Windham and similar soils: 25 percent
Rock outcrop: 15 percent

Minor Components
Whitecow and similar soils: 0 to 2 percent
Soils with cobbly loam surface layers: 0 to 1 percent
Soils with stony loam surface layers: 0 to 1 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Lap
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

Windham
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

Rock outcrop
Definition: Hard limestone bedrock

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

Management

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

Larry Series

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Low stream terraces and flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Endoaquolls

Typical Pedon

Larry silt loam, cool, 0 to 2 percent slopes, in an area of hayland, 2,400 feet south and 1,500 feet west of the northeast corner of sec. 18, T. 14 N., R. 8 W.

A—0 to 8 inches; very dark gray (5Y 3/1) silt loam, gray (5Y 5/1) dry; moderate very fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine and few medium roots; strongly effervescent; slightly alkaline; clear smooth boundary.

Bg1—8 to 13 inches; light brownish gray (10YR 6/2) silt loam, light gray (10YR 7/2) dry; common fine and medium prominent yellowish brown (10YR 5/6) moist redox concentrations; weak medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and few medium roots; many very fine tubular and interstitial pores; strongly effervescent; slightly alkaline; clear smooth boundary.

Bg2—13 to 20 inches; light brownish gray (10YR 6/2) silt loam with thin strata of sandy loam, light gray (10YR 7/2) dry; many fine and medium prominent yellowish brown (10YR 5/6) moist redox concentrations; weak medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and few medium roots; common very fine tubular and interstitial pores; slightly alkaline; gradual smooth boundary.

Cg—20 to 60 inches; gray (10YR 6/1) loam with thin strata of sandy loam and silt loam, light gray (10YR 7/1) dry; many fine and medium prominent yellowish brown (10YR 5/6) moist redox concentrations; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and medium roots; common very fine tubular and interstitial pores; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 46 degrees F
Thickness of the mollic epipedon: 8 to 18 inches
Depth to the seasonal high water table: 12 to 24 inches

A horizon
Hue: 5Y or N
Value: 2 or 3 moist 3 to 5 dry
Chroma: 0 or 1
Clay content: 18 to 27 percent
Effervescence: None to strongly
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 6.1 to 7.8

Bg horizons
Hue: 10YR or N
Value: 3 to 6 moist; 4, 6, or 7 dry
Chroma: 0 to 2
Texture: Clay loam, silt loam, or loam; may have thin strata of sandy loam
Clay content: 20 to 35 percent with more than 15 percent fine and coarser sand
Reaction: pH 6.6 to 7.8

Cg horizon
Hue: 10YR, 2.5Y, or N
Value: 5 or 6 moist; 4, 6, or 7 dry
Chroma: 0 to 2
Redox concentrations: 10YR 5/6 or 10YR 4/6
Texture: Clay loam, silt loam, or loam with strata of sandy loam
Clay content: 20 to 35 percent with more than 15 percent fine and coarser sand
Reaction: pH 6.6 to 7.8

2A—Larry silt loam, cool, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Larry and similar soils: 95 percent

Minor Components
Fairway, cool soils: 0 to 3 percent
Soils that have very gravelly sand at 2 feet: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 12 to 24 inches
Available water capacity: Mainly 10.5 inches

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

Management

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

Leavitt Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains and hills
Parent material: Alluvium or alpine till
Slope range: 4 to 30 percent
Elevation range: 4,800 to 6,000 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Fine-loamy, mixed, superactive Ustic Argicryolls

Typical Pedon

Leavitt stony loam, in an area of Leavitt-Libeg stony loams, 4 to 30 percent slopes, in an area of rangeland, 1,100 feet north and 50 feet east of the southwest corner of sec. 6, T. 18 N., R. 7 W.

A1—0 to 3 inches; very dark gray (10YR 3/1) stony loam, black (10YR 2/1) moist; moderate very thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 5 percent stones and cobbles and 10 percent pebbles; slightly acid; clear smooth boundary.

A2—3 to 7 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; slightly acid; clear smooth boundary.

Bt1—7 to 19 inches; brown (10YR 5/3) clay loam, dark brown (7.5YR 4/4) moist; moderate fine and medium prismatic parting to moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; continuous distinct dark brown (7.5YR 3/2) clay films on faces of peds; 10 percent pebbles; slightly acid; gradual smooth boundary.

Bt2—19 to 30 inches; brown (7.5YR 5/4) cobbly clay loam, brown (7.5YR 4/4) moist; moderate medium prismatic structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds; 15 percent cobbles and 15 percent pebbles; slightly acid; gradual smooth boundary.

Btk—30 to 36 inches; light brownish gray (2.5Y 6/2) cobbly clay loam, dark grayish brown (2.5Y 4/2) moist; weak medium prismatic parting to weak medium and coarse subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular

and interstitial pores; few faint clay films on faces of peds; 10 percent cobbles and 15 percent pebbles; continuous faint lime casts on undersides of coarse rock fragments; common fine seams and soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—36 to 60 inches; light brownish gray (2.5Y 6/2) very gravelly loam, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, very friable, moderately sticky, slightly plastic; few very fine roots; common very fine tubular and interstitial pores; 15 percent cobbles and 30 percent pebbles; continuous faint lime casts on undersides of rock fragments; common fine seams and soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 36 to 44 degrees F
Thickness of the mollic epipedon: 7 to 15 inches

A horizons
Hue: 7.5YR, 10YR, or 2.5Y
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 1 to 3
Clay content: 15 to 27 percent
Content of rock fragments: 15 to 35 percent stones, cobbles, and pebbles
Reaction: pH 6.6 to 7.3

Bt horizons
Hue: 5YR, 7.5YR, 10YR, or 2.5Y
Value: 4 to 6 dry; 3 to 5 moist
Chroma: 1 to 4
Texture: 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 8.4

Btk horizon
Hue: 5YR, 7.5YR, 10YR, or 2.5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Clay loam or silty clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 5 to 35 percent cobbles and pebbles
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 5YR, 7.5YR, 10YR, or 2.5Y
Value: 6 or 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loam or sandy clay loam
Clay content: 15 to 40 percent
Content of rock fragments: 35 to 60 percent cobbles and pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

299D—Leavitt-Libeg stony loams, 4 to 30 percent slopes

Setting

Landform:
- Leavitt—Hills
- Libeg—Hills

Slope:
- Leavitt—4 to 30 percent
- Libeg—4 to 30 percent

Elevation: 4,800 to 6,000 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Leavitt and similar soils: 70 percent
Libeg and similar soils: 25 percent

Minor Components
Cheadle and similar soils: 0 to 2 percent
Soils that have slopes more than 30 percent: 0 to 1 percent
Moderately deep soils: 0 to 1 percent
Soils with gravelly loam surface layers: 0 to 1 percent

Major Component Description

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

Libeg
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 inches

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

Management

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

Len Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 1 to 8 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Clayey over loamy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Len cobbly loam, 1 to 8 percent slopes, in an area of rangeland, 10 feet north and 100 feet west of the southeast corner of sec. 25, T. 17 N., R. 6 W.

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

Bt1—3 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine and medium granular structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 5 percent pebbles; neutral; gradual smooth boundary.

Bt2—7 to 17 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong medium prismatic parting to strong fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous distinct dark brown (10YR 3/3) moist clay films on faces of peds; 5 percent pebbles; neutral; gradual smooth boundary.

2Btk—17 to 22 inches; pale brown (10YR 6/3) very gravelly sandy clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; 10 percent cobbles and 40 percent pebbles; common fine soft masses of lime; continuous faint lime coats on rock fragments and continuous faint casts on undersides of rock fragments; strongly effervescent; slightly alkaline; clear smooth boundary.

2Bk1—22 to 40 inches; pale brown (10YR 6/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky, nonplastic; few very fine roots; common very fine tubular and interstitial pores; 10 percent cobbles and 50 percent pebbles; common fine seams and soft masses of lime; continuous faint lime casts on undersides of rock fragments; strongly effervescent; slightly alkaline; gradual smooth boundary.

2Bk2—40 to 60 inches; pale brown (10YR 6/3) very gravelly sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, moderately sticky, slightly plastic; few very fine roots; 10 percent cobbles and 50 percent pebbles; disseminated lime; continuous faint lime casts on undersides of rock fragments; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the 2Btk horizon: 11 to 24 inches

A horizon
Value: 3 or 4 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 20 to 27 percent
Content of rock fragments: 15 to 25 percent—5 to 10 percent cobbles; 10 to 15 percent pebbles
Reaction: pH 6.6 to 7.3

Bt1 horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 35 to 40 percent
Content of rock fragments: 5 to 35 percent—0 to 10 percent cobbles; 5 to 25 percent pebbles
Reaction: pH 6.6 to 7.3

Bt2 horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 3 or 4 moist
Texture: Clay loam or clay
Clay content: 35 to 45 percent

Content of rock fragments: 5 to 35 percent—0 to 10 percent cobbles; 5 to 25 percent pebbles
Reaction: pH 7.4 to 8.4

2Btk horizon
Hue: 5Y, 2.5Y, or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Texture: Sandy clay loam or clay loam
Clay content: 30 to 35 percent
Content of rock fragments: 35 to 60 percent—5 to 15 percent cobbles; 30 to 45 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

2Bk horizons
Hue: 5Y, 2.5Y, or 10YR
Value: 5 to 7 dry; 4 or 5 moist
Texture: Sandy loam or loam
Clay content: 5 to 10 percent
Content of rock fragments: 55 to 85 percent—10 to 30 percent cobbles; 45 to 55 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

944B—Len cobbly loam, 1 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 1 to 8 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Len and similar soils: 95 percent

Minor Components
Soils with no fragments: 0 to 3 percent
Soils with very gravelly upper subsoils: 0 to 2 percent

Major Component Description

Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.3 inches

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

Management

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

Libeg Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains and hills
Parent material: Colluvium, alluvium, or alpine till
Slope range: 4 to 45 percent
Elevation range: 4,600 to 7,800 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Ustic Argicryolls

Typical Pedon

Libeg very channery loam, in an area of Libeg-Cheadle-Rock outcrop complex, 15 to 45 percent slopes, in an area of rangeland, 200 feet north and 1,200 feet east of the southwest corner of sec. 30, T. 14 N., R. 5 W.

A1—0 to 5 inches; very dark grayish brown (10YR 3/2) very channery loam, black (10YR 2/1) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and common fine roots; 45 percent channers; moderately acid; clear smooth boundary.
A2—5 to 15 inches; dark grayish brown (10YR 4/2) very channery loam, very dark brown (10YR 2/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and common fine roots; 45 percent channers; moderately acid; clear smooth boundary.
Bt1—15 to 20 inches; light brown (7.5YR 6/4) very channery clay loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; few distinct

clay films on faces of peds; 55 percent channers; moderately acid; gradual smooth boundary.

Bt2—20 to 40 inches; light brown (7.5YR 6/4) extremely channery clay loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 10 percent cobbles and 55 percent channers; moderately acid; gradual smooth boundary.

BC—40 to 60 inches; reddish brown (5YR 5/4) extremely channery loam, reddish brown (5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 15 percent cobbles and 50 percent channers; neutral.

Range in Characteristics

Soil temperature: 36 to 44 degrees F
Thickness of the mollic epipedon: 8 to 16 inches
Content of rock fragments: Mainly argillite, igneous, quartzite, and sandstone

A horizons
Hue: 7.5YR or 10YR
Value: 3 or 4 dry; 2 or 3 moist
Chroma: 1 or 2
Clay content: 10 to 27 percent
Content of rock fragments: 15 to 60 percent—0 to 50 percent stones and cobbles; 5 to 50 percent pebbles or channers
Reaction: pH 6.1 to 7.3

Bt horizons
Hue: 5YR, 7.5YR, or 10YR
Value: 4 to 6 dry; 3 to 5 moist
Chroma: 2 to 4 or 6
Texture: Loam, sandy loam, or clay loam
Clay content: 15 to 32 percent
Content of rock fragments: 35 to 80 percent—5 to 50 percent stones and cobbles; 10 to 45 percent pebbles
Reaction: pH 6.1 to 7.3

BC horizon
Hue: 5YR or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 4 or 6
Texture: Sandy loam, sandy clay loam, or loam
Clay content: 10 to 20 percent
Content of rock fragments: 40 to 85 percent—10 to 50 percent stones and cobbles; 30 to 45 percent pebbles
Reaction: pH 5.6 to 7.3

93E—Libeg-Cheadle very channery loams, 15 to 45 percent slopes

Setting

Landform:
- Libeg—Mountains
- Cheadle—Mountains

Position on landform:
- Libeg—Backslopes and footslopes
- Cheadle—Backslopes and shoulders

Slope:
- Libeg—15 to 45 percent
- Cheadle—15 to 45 percent

Elevation: 5,500 to 7,800 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Libeg and similar soils: 60 percent
Cheadle and similar soils: 25 percent

Minor Components
Stemple and similar soils: 0 to 4 percent
Areas of rock outcrop: 0 to 4 percent
Areas with stony surface layers: 0 to 4 percent
Very shallow soils: 0 to 3 percent

Major Component Description

Libeg
Surface layer texture: Very 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 4.6 inches

Cheadle
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
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.

Management

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

593E—Libeg-Cheadle-Rock outcrop complex, 15 to 45 percent slopes

Setting

Landform:
- Libeg—Mountains
- Cheadle—Mountains

Position on landform:
- Libeg—Backslopes and footslopes
- Cheadle—Backslopes and shoulders
- Rock outcrop—Backslopes and shoulders

Slope:
- Libeg—15 to 45 percent
- Cheadle—15 to 45 percent

Elevation: 5,500 to 7,800 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Libeg and similar soils: 40 percent
Cheadle and similar soils: 30 percent
Rock outcrop: 15 percent

Minor Components
Very shallow soils: 0 to 4 percent
Soils with stony surface layers: 0 to 4 percent
Soils on north aspects: 0 to 4 percent
Deep soils in drainageways: 0 to 3 percent

Major Component Description

Libeg
Surface layer texture: Very 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 4.6 inches

Cheadle
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.2 inches

Rock outcrop
Definition: Argillite and igneous bedrock

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

Management

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

Lihen Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Rapid
Landform: Alluvial fans and hills
Parent material: Sandy alluvium or eolian deposits
Slope range: 2 to 35 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Sandy, mixed, frigid Entic Haplustolls

Typical Pedon

Lihen loamy fine sand, in an area of Lihen-Chinook complex, 2 to 35 percent slopes, in an area of rangeland, 300 feet south and 1,100 feet west of the northeast corner of sec. 17, T. 14 N., R. 3 W.

A1—0 to 6 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine roots; neutral; clear smooth boundary.

A2—6 to 20 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium prismatic parting to weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine roots; neutral; gradual smooth boundary.

A3—20 to 30 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky,

nonplastic; common very fine roots; neutral; gradual smooth boundary.
C—30 to 60 inches; pale brown (10YR 6/3) loamy fine sand, dark brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky, nonplastic; few very fine roots; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 12 to 30 inches

A horizons
Hue: 10YR or 2.5Y
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 5 to 10 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
Reaction: pH 6.6 to 8.4

556D—Lihen-Chinook complex, 2 to 35 percent slopes

Setting

Landform:
- Lihen—Hills
- Chinook—Hills

Slope:
- Lihen—2 to 35 percent
- Chinook—2 to 35 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Lihen and similar soils: 50 percent
Chinook and similar soils: 40 percent

Minor Components
Brocko and similar soils: 0 to 3 percent
Crago and similar soils: 0 to 3 percent
Soils that have slopes more than 35 percent: 0 to 2 percent
Areas of rock outcrop: 0 to 1 percent
Soils with gravel at a depth of 40 inches: 0 to 1 percent

Major Component Description

Lihen
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 5.7 inches

Chinook
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 7.2 inches

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

Management

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

Marmarth Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and sedimentary plains
Parent material: Material derived from sandstone, siltstone, or shale
Slope range: 2 to 25 percent
Elevation range: 3,500 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Argiustolls

Typical Pedon

Marmarth loam, in an area of Marmarth-Delpoint loams, 2 to 8 percent slopes, in an area of rangeland,

300 feet north and 50 feet east of the southwest corner of sec. 36, T. 20 N., R. 4 W.

A—0 to 3 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; neutral; clear smooth boundary.

Bt—3 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; strong medium prismatic structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; slightly alkaline; clear smooth boundary.

Bk1—9 to 15 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; moderate medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; common fine and medium soft masses of lime; many faint lime coats on faces of peds; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk2—15 to 22 inches; white (10YR 8/2) loam, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular and interstitial pores; 3 percent angular sandstone pebbles; many fine soft masses of lime; many faint lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—22 to 30 inches; white (10YR 8/2) loam, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular and interstitial pores; 3 percent angular sandstone pebbles; disseminated lime; many faint lime coats on faces of peds; violently effervescent; moderately alkaline; clear smooth boundary.

Cr—30 to 60 inches; pale yellow (5Y 7/3) semiconsolidated sandstone; few very fine roots in cracks in upper part; strongly effervescent.

Range in Characteristics

Depth to the Cr horizon: 20 to 40 inches
Thickness of the mollic epipedon: 7 to 16 inches

A horizon
Value: 3 to 5 moist
Chroma: 2 or 3
Clay content: 20 to 27 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 horizons
Hue: 2.5Y or 5Y
Value: 5 to 8 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loam, fine sandy loam, or clay loam
Clay content: 15 to 30 percent
Calcium carbonate equivalent: 15 to 25 percent
Reaction: pH 7.4 to 8.4

Cr horizon
Material: Soft sandstone or stratified soft sandstone and siltstone

382C—Marmarth-Delpoint loams, 2 to 8 percent slopes

Setting

Landform:
- Marmarth—Sedimentary plains
- Delpoint—Sedimentary plains

Slope:
- Marmarth—2 to 8 percent
- Delpoint—2 to 8 percent

Elevation: 3,500 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Marmarth and similar soils: 45 percent
Delpoint and similar soils: 40 percent

Minor Components
Cabbart and similar soils: 0 to 4 percent
Amesha and similar soils: 0 to 4 percent
Shallow clayey soils: 0 to 4 percent
Moderately sodic soils: 0 to 3 percent

Major Component Description

Marmarth
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained

Dominant parent material: Semiconsolidated sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.9 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 4.9 inches

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

Management

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

Meadowcreek Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderate to a depth of 35 inches and rapid below
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Fluvaquentic Haplustolls

Typical Pedon

Meadowcreek loam, in an area of Meadowcreek-Fairway complex, 0 to 2 percent slopes, in an area of cropland, 1,300 feet south and 2,000 feet east of the northwest corner of sec. 8, T. 10 N., R. 3 W.

Ap—0 to 5 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A1—5 to 10 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many fine tubular and interstitial pores; strongly effervescent; moderately alkaline; clear smooth boundary.

A2—10 to 15 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; weak medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; slightly alkaline; clear smooth boundary.

Bg1—15 to 27 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; few fine distinct brown (7.5YR 5/3) redox concentrations; weak coarse prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; neutral; gradual smooth boundary.

Bg2—27 to 35 inches; gray (10YR 6/1) sandy loam, dark grayish brown (10YR 4/2) moist; common fine distinct brown (7.5YR 5/4) redox concentrations; weak coarse prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; neutral; clear smooth boundary.

2Cg—35 to 60 inches; variegated colors, very gravelly sand; single grain; loose, nonsticky, nonplastic; few very fine roots; 55 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 10 to 15 inches
Depth to the 2C horizon: 20 to 40 inches
Depth to the seasonal high water table: 24 to 42 inches

A horizons
Hue: 10YR or 2.5Y
Value: 2 or 3 moist; 4 or 5 dry
Chroma: 1 or 2
Clay content: 18 to 25 percent
Content of rock fragments: 0 to 5 percent pebbles
Calcium carbonate equivalent: 0 to 5 percent
Reaction: pH 7.4 to 8.4

B horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 3 or 4 moist; 5 or 6 dry
Chroma: 1 to 3

Texture: Loam, sandy loam, sandy clay loam, or silt loam
Clay content: 18 to 25 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.6 to 7.8

2C horizon
Texture: Sand or loamy sand
Clay content: 0 to 10 percent
Content of rock fragments: 50 to 75 percent—0 to 15 percent stones and cobbles; 50 to 70 percent pebbles
Reaction: pH 6.1 to 7.3

218A—Meadowcreek-Fairway complex, 0 to 2 percent slopes

Setting

Landform:
- Meadowcreek—Flood plains
- Fairway—Flood plains

Slope:
- Meadowcreek—0 to 2 percent
- Fairway—0 to 2 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Meadowcreek and similar soils: 70 percent
Fairway and similar soils: 25 percent

Minor Components
Villy and similar soils: 0 to 2 percent
Well drained soils: 0 to 2 percent
Soils that are shallow to sand and gravel: 0 to 1 percent

Major Component Description

Meadowcreek
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Available water capacity: Mainly 6.3 inches

Fairway
Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Available water capacity: Mainly 8.6 inches

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

Management

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

Megonot Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Hills and sedimentary plains
Parent material: Semiconsolidated shale and mudstone
Slope range: 4 to 35 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, smectitic, frigid Torrertic Haplustepts

Typical Pedon

Megonot silty clay, in an area of Megonot-Weingart complex, 8 to 35 percent slopes, in an area of rangeland, 2,630 feet south and 800 feet west of the northeast corner of sec. 15, T. 20 N., R. 7 W.

A1—0 to 1 inch; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate very fine granular structure; slightly hard, firm, moderately sticky, moderately plastic; many very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.
A2—1 to 4 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky parting to weak very fine granular structure; hard, firm, moderately sticky, moderately plastic; many very fine roots; many very fine tubular and interstitial pores; strongly effervescent; moderately alkaline; clear smooth boundary.
Bw—4 to 11 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist;

moderate medium prismatic parting to moderate medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many shiny pressure faces on peds; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—11 to 23 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bky—23 to 30 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 4/2) moist; weak fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; 50 percent angular and platy mudstone fragments; common fine seams of gypsum; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—30 to 60 inches; light olive gray (5Y 6/2) semiconsolidated mudstone, olive gray (5Y 4/2) moist; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Depth to secondary lime: 11 to 27 inches
Depth to the paralithic contact: 20 to 40 inches

A horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 5 to 10 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 or 3
Texture: Silty clay loam, clay loam, or silty clay
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 15 percent hard pebbles; 0 to 15 percent soft pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Silty clay loam, clay loam, or silty clay
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 15 percent hard pebbles; 0 to 15 percent soft pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Bky horizon
Hue: 2.5Y or 5Y
Value: 4 to 6 dry; 3 or 4 moist
Chroma: 2 or 3
Texture: Silty clay loam, clay loam, or silty clay
Clay content: 35 to 45 percent
Content of rock fragments: 10 to 50 percent soft shale; 5 to 30 percent hard shale fragments
Gypsum content: 1 to 5 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 6.6 to 8.4

Cr horizon
Material: Semiconsolidated shale or mudstone

146C—Megonot silty clay, 4 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 4 to 8 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Megonot and similar soils: 95 percent

Minor Components
Soils that are shallow to shale: 0 to 2 percent
Deep silty clay soils: 0 to 2 percent
Moderately sodic soils: 0 to 1 percent

Major Component Description

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

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

Management

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

149D—Megonot-Weingart complex, 8 to 35 percent slopes

Setting

Landform:
- Megonot—Hills
- Weingart—Hills

Position on landform:
- Megonot—Backslopes and shoulders
- Weingart—Footslopes

Slope:
- Megonot—8 to 35 percent
- Weingart—8 to 15 percent

Elevation: 3,600 to 4,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Megonot and similar soils: 45 percent
Weingart and similar soils: 40 percent

Minor Components
Areas of rock outcrop: 0 to 5 percent
Shallow silty clay soils: 0 to 5 percent
Soils that are gravelly: 0 to 5 percent

Major Component Description

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

Weingart
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, clayey sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.9 inches

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

Management

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

Mikesell Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Mountains
Parent material: Alpine till or colluvium
Slope range: 8 to 60 percent
Elevation range: 4,600 to 6,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free season: 50 to 70 days

Taxonomic Class: Fine, smectitic Eutric Haplocryalfs

Typical Pedon

Mikesell stony loam, 8 to 35 percent slopes, in an area of woodland, 2,000 feet north and 2,000 feet west of the southeast corner of sec. 9, T. 13 N., R. 9 W.

Oi—2 inches to 0; forest litter of partially decomposed needles, twigs, and roots; abrupt smooth boundary.

A—0 to 4 inches; dark gray (10YR 4/1) stony loam, very dark gray (10YR 3/1) moist; moderate very thin platy parting to moderate very fine granular structure; soft, very friable, moderately sticky, slightly plastic; many very fine and fine roots; 5 percent stones, 5 percent cobbles; and 5 percent angular pebbles; moderately acid; clear smooth boundary.

E—4 to 9 inches; light brownish gray (10YR 6/2) cobbly loam, dark grayish brown (10YR 4/2) moist; moderate very thin platy parting to moderate very fine and fine granular structure; soft, very friable, moderately sticky, slightly plastic; many very fine and fine and few medium roots; many silt and sand skeletans on faces of peds; 10 percent cobbles and 5 percent angular pebbles; moderately acid; clear smooth boundary.

Bt/E—9 to 20 inches; 90 percent is pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist (B part); 10 percent is light gray (10YR 7/2) loam, brown (10YR 4/3) moist (E part); moderate medium prismatic parting to moderate medium and coarse subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; common silt and sand skeletans on faces of peds; 10 percent angular pebbles; moderately acid; clear smooth boundary.

Bt1—20 to 40 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; very hard, very firm, very sticky, and very plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; continuous distinct dark grayish brown (10YR 4/2) clay films on faces of peds and on coarse rock fragments; 5 percent angular cobbles and 5 percent angular pebbles; neutral; gradual smooth boundary.

Bt2—40 to 60 inches; pale brown (10YR 6/3) cobbly clay, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine roots; common very fine tubular and interstitial pores; many distinct clay films on faces of peds; 25 percent angular cobbles and 5 percent angular pebbles; neutral.

Range in Characteristics

Soil temperature: 35 to 40 degrees F

A and E horizons

Value: 4, 6, or 7 dry; 3 to 5 moist
Chroma: 2 or 3
Clay content: 15 to 25 percent
Content of rock fragments: 0 to 25 percent—1 to 5 percent stones; 0 to10 percent cobbles; 0 to 10 percent pebbles
Reaction: pH 5.1 to 6.5

Bt horizons

Hue: 10YR or 2.5Y
Value: 4 or 5 moist
Chroma: 2 or 3
Texture: Clay, silty clay, or clay loam
Clay content: 35 to 45 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 5.1 to 7.3

296F—Mikesell-Swiftcurrent loams, 25 to 60 percent slopes

Setting

Landform:
- Mikesell—Mountains
- Swiftcurrent—Mountains

Slope:
- Mikesell—25 to 60 percent
- Swiftcurrent—25 to 60 percent

Elevation: 4,800 to 6,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Mikesell and similar soils: 50 percent
Swiftcurrent and similar soils: 40 percent

Minor Components
Cowood and similar soils: 0 to 3 percent
Tigeron and similar soils: 0 to 3 percent
Soils that are deep to shale: 0 to 3 percent
Soils with stony surface layers: 0 to 1 percent

Major Component Description

Mikesell
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.9 inches

Swiftcurrent
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forestland
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.

Management

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

515E—Mikesell stony loam, 8 to 35 percent slopes

Setting

Landform: Mountains
Slope: 8 to 35 percent
Elevation: 5,000 to 5,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Mikesell and similar soils: 95 percent

Minor Components
Soils with more rock fragments: 0 to 2 percent
Soils that are shallow to soft bedrock: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
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.

Management

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

Mocmont Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium derived from argillite and igneous rock
Slope range: 8 to 60 percent
Elevation range: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 25 inches
Frost-free period: 70 to 110 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Mocmont very channery loam, in an area of Mocmont-Tolex complex, 25 to 60 percent slopes, in an area of woodland, 1,000 feet north and 1,500 feet west of the southeast corner of sec. 6, T. 13 N., R. 5 W.

Oi—2 inches to 0; forest litter of partially decomposed needles, twigs, and roots; abrupt smooth boundary.

E1—0 to 4 inches; light brownish gray (10YR 6/2) very channery loam, dark grayish brown (10YR 4/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; 45 percent channers; moderately acid; gradual smooth boundary.

E2—4 to 14 inches; light brownish gray (10YR 6/2) very channery loam, dark brown (10YR 4/3) moist; moderate thin platy parting to moderate very fine and fine granular structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine and fine and few medium roots; many very fine tubular and interstitial pores; 55 percent channers; moderately acid; gradual smooth boundary.

E/Bt—14 to 21 inches; 80 percent pinkish gray (7.5YR 6/2) extremely channery loam, dark brown (7.5YR 4/2) moist (E part); 20 percent light brown (7.5YR 6/4) dry; extremely channery clay loam, dark brown (10YR 4/3) moist (B part); moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; common faint clay films of faces of peds; 65 percent channers; moderately acid; gradual smooth boundary.

Bt/E—21 to 36 inches; 80 percent light brown (7.5YR 6/4) extremely channery clay loam, dark brown (10YR 4/3) moist (B part); 20 percent light gray (10YR 7/1) dry; extremely channery loam, dark brown (7.5YR 4/2) moist (E part); moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 65 percent channers; moderately acid; gradual smooth boundary.

Bt—36 to 60 inches; light brown (7.5YR 6/4) extremely channery clay loam, dark brown (7.5YR 4/4) moist; moderate fine and medium

subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine and fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; few silt and sand skeletans on faces of peds; 70 percent channers; moderately acid.

Range in Characteristics

Soil temperature: 42 to 45 degrees F
Depth to the argillic horizon: 10 to 24 inches

E horizons
Hue: 7.5YR or 10YR
Value: 5 to 8 dry; 4 to 6 moist
Chroma: 2 or 3
Clay content: 15 to 20 percent
Content of rock fragments: 35 to 60 percent—0 to 10 percent angular cobbles; 35 to 50 percent angular pebbles or channers
Reaction: pH 5.6 to 6.5

E/Bt and Bt/E horizons
Hue: 7.5YR or 10YR
Value: E part—6 or 7 dry; 4 or 5 moist; B part—5 to 7 dry; 4 or 5 moist
Chroma: 1 to 4
Texture: E part—sandy loam or loam; B part—loam or clay loam
Clay content: E part—10 to 20 percent; B part—25 to 35 percent
Content of rock fragments: 35 to 60 percent—10 to 30 percent angular cobbles; 25 to 55 percent angular pebbles or channers
Reaction: pH 5.6 to 6.5

Bt horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 3, 4, or 6
Texture: Loam, clay loam, or sandy clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 35 to 85 percent—10 to 30 percent angular cobbles; 25 to 55 percent angular pebbles or channers
Reaction: pH 5.6 to 6.5

27F—Mocmont-Bignell-Tolex very stony loams, 25 to 60 percent slopes

Setting

Landform:
- Mocmont—Mountains
- Bignell—Mountains
- Tolex—Mountains

Position on landform:
- Mocmont—Backslopes
- Bignell—Backslopes and footslopes
- Tolex—Backslopes and shoulders

Slope:
- Mocmont—25 to 60 percent
- Bignell—25 to 60 percent
- Tolex—25 to 60 percent

Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 105 days

Composition

Major Components
Mocmont and similar soils: 45 percent
Bignell and similar soils: 30 percent
Tolex and similar soils: 15 percent

Minor Components
Areas of rock outcrop: 0 to 3 percent
Soils with extremely stony surface layers: 0 to 3 percent
Areas of rubble land: 0 to 3 percent
Soils with less rock fragments: 0 to 1 percent

Major Component Description

Mocmont
Surface layer texture: Very stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.5 inches

Bignell
Surface layer texture: Very stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

Tolex
Surface layer texture: Very stony loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.0 inches

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

Management

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

63D—Mocmont-Tolex complex, 8 to 25 percent slopes

Setting

Landform:
- Mocmont—Mountains
- Tolex—Mountains

Position on landform:
- Mocmont—Backslopes and footslopes
- Tolex—Backslopes and shoulders

Slope:
- Mocmont—8 to 25 percent
- Tolex—8 to 25 percent

Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 105 days

Composition

Major Components
Mocmont and similar soils: 75 percent
Tolex and similar soils: 20 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Soils that have slopes more than 25 percent: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Mocmont
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

63F—Mocmont-Tolex complex, 25 to 60 percent slopes

Setting

Landform:
- Mocmont—Mountains
- Tolex—Mountains

Position on landform:
- Mocmont—Backslopes
- Tolex—Backslopes and shoulders

Slope:
- Mocmont—25 to 60 percent
- Tolex—25 to 60 percent

Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Mocmont and similar soils: 70 percent
Tolex and similar soils: 20 percent

Minor Components
Holter and similar soils: 0 to 4 percent
Areas of rock outcrop: 0 to 3 percent
Moderately deep soils: 0 to 3 percent

Major Component Description

Mocmont
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained

Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

84E—Mocmont-Tolex complex, cool, 8 to 25 percent slopes

Setting

Landform:
- Mocmont—Mountains
- Tolex—Mountains

Position on landform:
- Mocmont—Backslopes
- Tolex—Backslopes and shoulders

Slope:
- Mocmont—8 to 25 percent
- Tolex—8 to 25 percent

Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Mocmont and similar soils: 65 percent
Tolex and similar soils: 30 percent

Minor Components
Soils with less rock fragments: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Mocmont
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

84F—Mocmont-Tolex complex, cool, 25 to 60 percent slopes

Setting

Landform:
- Mocmont—Mountains
- Tolex—Mountains

Position on landform:
- Mocmont—Backslopes
- Tolex—Backslopes and shoulders

Slope:
- Mocmont—25 to 60 percent
- Tolex—25 to 60 percent

Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Mocmont and similar soils: 75 percent
Tolex and similar soils: 20 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Very shallow soils: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Mocmont
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained

Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

184E—Mocmont very channery loam, cool, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Mocmont and similar soils: 95 percent

Minor Components
Tolex and similar soils: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

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

Management

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

384E—Mocmont-Tolex-Hilger very stony loams, 15 to 45 percent slopes

Setting

Landform:
- Mocmont—Mountains
- Tolex—Mountains
- Hilger—Mountains

Position on landform:
- Mocmont—Backslopes and footslopes
- Tolex—Backslopes and shoulders
- Hilger—Backslopes and footslopes

Slope:
- Mocmont—15 to 45 percent
- Tolex—15 to 45 percent
- Hilger—15 to 45 percent

Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 25 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Mocmont and similar soils: 55 percent
Tolex and similar soils: 20 percent
Hilger and similar soils: 20 percent

Minor Components
Regent and similar soils: 0 to 2 percent
Soils that have slopes more than 45 percent: 0 to 2 percent
Soils with cobbly loam surface layers: 0 to 1 percent

Major Component Description

Mocmont
Surface layer texture: Very stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.5 inches

Tolex
Surface layer texture: Very stony loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.0 inches

Hilger
Surface layer texture: Very stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.7 inches

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

Management

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

684F—Mocmont-Tolex complex, moist, 30 to 60 percent slopes

Setting

Landform:
- Mocmont—Mountains
- Tolex—Mountains

Position on landform:
- Mocmont—Backslopes
- Tolex—Backslopes and shoulders

Slope:
- Mocmont—30 to 60 percent
- Tolex—30 to 60 percent

Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Mocmont and similar soils: 75 percent
Tolex and similar soils: 20 percent

Minor Components
Holter and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Mocmont
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

Musselshell Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans
Parent material: Alluvium from limestone
Slope range: 2 to 35 percent
Elevation range: 3,600 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free season: 105 to 120 days

Taxonomic Class: Coarse-loamy, carbonatic, frigid Aridic Calciustepts

Typical Pedon

Musselshell loam, in an area of Musselshell-Crago complex, 2 to 8 percent slopes, in an area of urban land, 100 feet south and 2,600 feet east of the northwest corner of sec. 28, T. 10 N., R. 3 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; moderate very thin platy parting to weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 10 percent

pebbles; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk1—4 to 8 inches; light gray (10YR 7/2) gravelly loam, brown (10YR 5/3) moist; weak medium prismatic parting to weak medium and coarse subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; 15 percent pebbles; few faint lime coats on faces of peds; continuous faint lime casts on undersides of pebbles; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—8 to 34 inches; white (10YR 8/2) gravelly loam, pale brown (10YR 6/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 15 percent pebbles; disseminated lime and common moderately thick lime coats on sides and undersides of pebbles; common fine and medium soft masses of lime; continuous faint lime coats on pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—34 to 50 inches; white (10YR 8/2) very gravelly sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, moderately sticky, slightly plastic; few very fine roots; common very fine tubular and interstitial pores; 50 percent pebbles; disseminated lime; continuous faint lime coats on pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

Bkz—50 to 60 inches; very pale brown (10YR 8/3) very gravelly loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, moderately sticky, slightly plastic; few very fine roots; 35 percent pebbles; few fine seams and soft masses of salt; disseminated lime; continuous faint lime coats on pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

A horizon
- Hue: 10YR or 2.5Y
- Value: 4 to 6 dry; 3 or 4 moist
- Chroma: 2 to 4
- Clay content: 20 to 27 percent
- Content of rock fragments: 0 to 10 percent stones; 0 to 25 percent cobbles; 0 to 35 percent pebbles
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 7.4 to 8.4

Bk horizons
- Hue: 10YR or 2.5Y
- Value: 6 to 8 dry; 4 to 6 moist
- Chroma: 2 to 4
- Clay content: 10 to 27 percent
- Content of rock fragments: 0 to 35 percent—0 to 10 percent cobbles; 0 to 25 percent pebbles
- Calcium carbonate equivalent: 40 to 60 percent
- Reaction: pH 7.9 to 9.0

Bkz horizon
- Hue: 10YR or 2.5Y
- Value: 5 to 8 dry; 4 to 6 moist
- Chroma: 2 to 4
- Texture: Fine sandy loam, sandy loam, or loam
- Clay content: 10 to 18 percent
- Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 30 to 50 percent pebbles
- Calcium carbonate equivalent: 40 to 60 percent
- Reaction: pH 7.9 to 9.0

137B—Musselshell-Crago complex, 2 to 8 percent slopes

Setting

Landform:
- Musselshell—Alluvial fans
- Crago—Alluvial fans

Slope:
- Musselshell—2 to 8 percent
- Crago—2 to 8 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Musselshell and similar soils: 70 percent
Crago and similar soils: 25 percent

Minor Components
Amesha and similar soils: 0 to 2 percent
Soils with cobbly loam surface layers: 0 to 2 percent
Soils that are moderately deep to bedrock: 0 to 1 percent

Major Component Description

Musselshell
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches

Crago
Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

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

Management

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

341D—Musselshell-Crago-Pensore complex, 4 to 25 percent slopes

Setting

Landform:
- Musselshell—Alluvial fans
- Crago—Alluvial fans
- Pensore—Hills

Slope:
- Musselshell—4 to 25 percent
- Crago—4 to 25 percent
- Pensore—4 to 25 percent

Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Musselshell and similar soils: 40 percent
Crago and similar soils: 25 percent
Pensore and similar soils: 20 percent

Minor Components
Amesha and similar soils: 0 to 4 percent
Soils that have slopes more than 25 percent: 0 to 4 percent
Areas of rock outcrop: 0 to 4 percent
Moderately deep soils: 0 to 3 percent

Major Component Description

Musselshell
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches

Crago
Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

Pensore
Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Rangeland
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.

437C—Musselshell-Sappington loams, 2 to 8 percent slopes

Setting

Landform:
- Musselshell—Alluvial fans
- Sappington—Alluvial fans

Slope:
- Musselshell—2 to 8 percent
- Sappington—2 to 8 percent

Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Musselshell and similar soils: 50 percent
Sappington and similar soils: 35 percent

Minor Components
Crago and similar soils: 0 to 7 percent
Soils that are shallow to bedrock: 0 to 4 percent
Soils with gravelly loam surface layers: 0 to 4 percent

Major Component Description

Musselshell
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches

Sappington
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 8.0 inches

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

Management

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

Neen Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,600 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free season: 105 to 120 days

Taxonomic Class: Fine-silty, mixed, superactive, frigid Aridic Calciustepts

Typical Pedon

Neen silt loam, 0 to 2 percent slopes, in an area of pasture; 200 feet north and 900 feet west of the southeast corner of sec. 16, T. 11 N., R. 3 W.

Apz—0 to 8 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure with 1/8- to 1/4-inch crust at surface; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; common fine seams and masses of salts; disseminated lime; strongly effervescent; strongly alkaline; clear smooth boundary.

Bwz1—8 to 22 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; common very fine tubular and interstitial pores; common fine seams of salts; disseminated lime; violently effervescent; strongly alkaline; clear smooth boundary.

Bwz2—22 to 33 inches; very pale brown (10YR 8/3) silt loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable, moderately sticky, slightly plastic; common very fine roots; common very fine tubular and interstitial pores; few fine seams and masses of salts; disseminated lime; few soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bwz3—33 to 39 inches; very pale brown (10YR 8/3) silty clay loam, light yellowish brown (10YR 6/4) moist; common medium prominent strong brown (7.5YR 5/6) redox concentrations; massive; hard, friable, moderately sticky, moderately plastic; disseminated lime; common soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bkg1—39 to 48 inches; light gray (10YR 7/2) silty clay loam, brown (10YR 5/2) moist; common medium prominent strong brown (7.5YR 5/6) redox concentrations; massive; hard, friable, moderately sticky, moderately plastic; disseminated lime; common soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bkg2—48 to 60 inches; white (10YR 8/2) loam, pale brown (10YR 6/3) moist; common medium distinct strong brown (7.5YR 5/6) redox concentrations and gray (10YR 6/1) redox depletions; massive; hard, very friable, moderately sticky, slightly plastic; 5 percent

pebbles; disseminated lime; common large soft masses of lime; violently effervescent; moderately alkaline; clear smooth boundary.

Range in Characteristics

Soil temperature: 40 to 44 degrees F
Depth to the seasonal high water table: 24 to 42 inches

Apz horizon
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 2 to 4 moist
Chroma: 1 or 2
Clay content: 20 to 27 percent
Sodium adsorption ratio: 13 to 30
Electrical conductivity: 8 to 16 mmhos/cm
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 9.0

Bwz horizons
Hue: 2.5Y or 5Y
Value: 7 or 8 dry; 5 to 7 moist
Chroma: 1 to 4
Redox concentrations: None to common; 7.5YR 5/6, 5YR 4/6, or 5YR 5/8
Texture: Silty clay loam or silt loam
Clay content: 20 to 35 percent
Calcium carbonate equivalent: 20 to 40 percent
Sodium adsorption ratio: 13 to 30
Electrical conductivity: 2 to 16 mmhos/cm
Reaction: pH 7.4 to 9.0

Bkg horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 6 to 8 dry; 3 to 6 moist
Chroma: 1 to 3
Redox depletions and concentrations: Few to many; 10YR 6/1, 7.5YR 5/6, 5YR 4/6, or 5YR 5/8
Texture: Silty clay loam, clay loam, loam, or silt loam
Clay content: 20 to 35 percent
Sodium adsorption ratio: 13 to 30
Electrical conductivity: 8 to 16 mmhos/cm
Calcium carbonate equivalent: 15 to 40 percent
Reaction: pH 7.9 to 9.0

115A—Neen silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,600 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Neen and similar soils: 95 percent

Minor Components
Villy and similar soils: 0 to 3 percent
Very deep saline and sodic soils: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 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.

Management

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

Niart Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 3 percent
Elevation range: 3,800 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, carbonatic, frigid Aridic Calciustolls

Typical Pedon

Niart loam, 0 to 3 percent slopes, in an area of rangeland, 300 feet north and 2,500 feet east of the southwest corner of sec. 16, T. 20 N., R. 4 W.

A—0 to 5 inches; dark grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist;

moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 5 percent cobbles and 5 percent pebbles; slightly effervescent; slightly alkaline; clear smooth boundary.

Bk1—5 to 8 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; moderate medium prismatic structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; continuous faint thin lime casts on undersides of pebbles; disseminated lime; few soft masses of lime; continuous distinct lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—8 to 27 inches; white (10YR 8/2) loam, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; continuous faint lime casts on undersides of pebbles; common fine and medium soft masses of lime; continuous distinct lime coats on faces of peds; violently effervescent; moderately alkaline; clear smooth boundary.

2Bk3—27 to 60 inches; light gray (10YR 7/2) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots in upper part; 65 percent pebbles; continuous faint lime casts on undersides of pebbles; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the 2Bk horizon: 19 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 3 moist
Chroma: 2 or 3
Clay content: 20 to 27 percent
Content of rock fragments: 5 to 15 percent—0 to 5 percent cobbles; 5 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bk horizons
Hue: 10YR or 2.5Y
Value: 6 to 8 dry; 5 to 7 moist
Chroma: 2 to 4
Texture: Loam or clay loam
Clay content: 25 to 35 percent (20 to 30 percent noncarbonate clay)
Content of rock fragments: 5 to 30 percent—0 to 5 percent cobbles; 5 to 25 percent pebbles
Calcium carbonate equivalent: 40 to 55 percent
Reaction: pH 7.9 to 8.4

2Bk3 horizon
Hue: 10YR or 2.5Y
Value: 6 to 8 dry; 5 to 7 moist
Chroma: 2 to 4
Texture: Loam, sandy clay loam, or sandy loam
Clay content: 20 to 30 percent (10 to 25 percent noncarbonate clay)
Content of rock fragments: 35 to 80 percent—5 to 10 percent cobbles; 30 to 70 percent pebbles
Calcium carbonate equivalent: 40 to 55 percent
Reaction: pH 7.9 to 8.4

43A—Niart loam, 0 to 3 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 3 percent
Elevation: 3,800 to 4,200 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Niart and similar soils: 95 percent

Minor Components
Sappington and similar soils: 0 to 2 percent
Soils with cobbly loam surface layers: 0 to 2 percent
Soils with sand and gravel at 30 inches: 0 to 1 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.1 inches

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

Management

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

Nippt Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 15 inches and rapid below
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Aridic Haplustalfs

Typical Pedon

Nippt gravelly loam, in an area of Nippt-Geohrock gravelly loams, 2 to 4 percent slopes, in an area of rangeland, 2,300 feet north and 1,600 feet east of the southwest corner of sec. 25, T. 12 N., R. 5 W.

E—0 to 3 inches; light brownish gray (10YR 6/2) gravelly loam, dark brown (10YR 4/3) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine vesicular pores; 15 percent pebbles; slightly alkaline; clear smooth boundary.

Bt—3 to 9 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; many very fine tubular and interstitial pores; many distinct dark brown (10YR 3/3) moist clay films on faces of peds; 25 percent pebbles; slightly alkaline; clear smooth boundary.

Bk1—9 to 15 inches; light gray (10YR 7/2) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; continuous distinct lime casts on undersides of pebbles; 60 percent pebbles; violently effervescent; moderately alkaline; clear smooth boundary.

2Bk2—15 to 60 inches; light gray (10YR 7/2) extremely gravelly sand, dark brown (10YR 4/3) moist; single grain; loose, nonsticky, nonplastic; common very fine and fine roots; continuous faint lime casts on undersides of pebbles; 65 percent pebbles; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 5 to 10 inches
Depth to the 2Bk2 horizon: 10 to 20 inches

E horizon
- Hue: 10YR or 7.5YR
- Value: 6 dry; 3 or 4 moist
- Chroma: 2 or 3
- Clay content: 15 to 25 percent
- Content of rock fragments: 15 to 60 percent—0 to 30 percent cobbles; 5 to 30 percent pebbles
- Reaction: pH 6.6 to 7.8

Bt horizon
- Hue: 10YR to 7.5YR
- Value: 5 or 6 dry; 3 or 4 moist
- Chroma: 3 or 4
- Clay content: 27 to 35 percent
- Content of rock fragments: 20 to 60 percent—0 to 20 percent cobbles; 15 to 50 percent pebbles
- Reaction: pH 6.6 to 7.8

Bk1 horizon
- Hue: 10YR or 7.5YR
- Value: 6 to 8 dry; 4 to 6 moist
- Chroma: 2 to 4
- Texture: Sandy loam or loam
- Clay content: 5 to 15 percent
- Content of rock fragments: 50 to 70 percent—0 to 25 percent cobbles; 35 to 60 percent pebbles
- Calcium carbonate equivalent: 10 to 15 percent
- Reaction: pH 7.9 to 8.4

2Bk2 horizon
- Hue: 10YR or 7.5YR
- Value: 6 or 7 dry; 4 or 5 moist
- Chroma: 2 to 4
- Clay content: 0 to 5 percent
- Content of rock fragments: 60 to 80 percent—0 to 30 percent cobbles; 40 to 70 percent pebbles
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.4 to 9.0

206A—Nippt very cobbly loam, 0 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 4 percent
Elevation: 3,600 to 4,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Nippt and similar soils: 95 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 3 percent
Soils with loam surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.1 inches

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

Management

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

232B—Nippt-Geohrock gravelly loams, 2 to 4 percent slopes

Setting

Landform:
- Nippt—Stream terraces
- Geohrock—Stream terraces

Slope:
- Nippt—2 to 4 percent
- Geohrock—2 to 4 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Nippt and similar soils: 50 percent
Geohrock and similar soils: 45 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 3 percent
Soils with no rock fragments: 0 to 2 percent

Major Component Description

Nippt
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 2.1 inches

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

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

Management

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

306A—Nippt-Attewan-Beaverell complex, 0 to 4 percent slopes

Setting

Landform:
- Nippt—Stream terraces
- Attewan—Stream terraces
- Beaverell—Stream terraces

Slope:
- Nippt—0 to 4 percent
- Attewan—0 to 4 percent
- Beaverell—0 to 4 percent

Elevation: 3,600 to 4,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Nippt and similar soils: 55 percent
Attewan and similar soils: 20 percent
Beaverell and similar soils: 15 percent

Minor Components
Soils with cobbly loam surface layers: 0 to 4 percent
Soils with very gravelly loam surfaces: 0 to 3 percent
Soils that are calcareous throughout: 0 to 3 percent

Major Component Description

Nippt
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 2.1 inches

Attewan
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 4.4 inches

Beaverell
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 2.5 inches

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

Management

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

406A—Nippt gravelly loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Nippt and similar soils: 95 percent

Minor Components
Scravo and similar soils: 0 to 2 percent
Thess and similar soils: 0 to 2 percent
Soils that have slopes more than 2 percent: 0 to 1 percent

Major Component Description

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 2.1 inches

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

Management

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

506A—Nippt-Attewan complex, 0 to 2 percent slopes

Setting

Landform:
- Nippt—Stream terraces
- Attewan—Stream terraces

Slope:
- Nippt—0 to 2 percent
- Attewan—0 to 2 percent

Elevation: 3,600 to 4,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Nippt and similar soils: 70 percent
Attewan and similar soils: 25 percent

Minor Components
Soils with very cobbly loam surfaces: 0 to 5 percent

Major Component Description

Nippt
Surface layer texture: Cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 2.0 inches

Attewan
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 4.4 inches

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

Management

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

Nobe Series

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Very slow
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, smectitic, calcareous, frigid Torrertic Ustorthents

Typical Pedon

Nobe clay loam, in an area of Gerdrum-Nobe-Yamacall complex, 0 to 4 percent slopes, in an area of rangeland, 1,500 feet south and 2,000 feet east of the northwest corner of sec. 36, T. 20 N., R. 4 W.

E—0 to 1 inch; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine vesicular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bt—1 to 3 inches; light brownish gray (10YR 6/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic parting to moderate medium angular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; strongly effervescent; strongly alkaline; clear smooth boundary.

Byz1—3 to 30 inches; light brownish gray (10YR 6/2) silty clay, brown (10YR 5/3) moist; massive; hard, firm, moderately sticky, moderately plastic; common very fine roots; common fine seams and masses of gypsum and other salts; strongly effervescent; strongly alkaline; gradual smooth boundary.

Byz2—30 to 60 inches; light olive gray (5Y 6/2) clay loam, olive gray (5Y 4/2) moist; common fine distinct olive gray (5Y 5/2) redox depletions; massive; hard, firm, moderately sticky, moderately plastic; 5 percent pebbles; common fine seams and masses of gypsum and other salts; strongly effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the saturated zone: 24 to 42 inches for 1 to 4 months in the spring. The soil is moist below 42 inches when not saturated or frozen.
Other features: In some areas, the Bt horizon is recognized as having characteristics of an argillic horizon but does not meet the minimum thickness requirements.

E horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 3 to 5 moist
Chroma: 2 or 3
Texture: Loam (clay loam when mixed to 7 inches)
Clay content: 20 to 27 percent
Electrical conductivity: 4 to 8 mmhos/cm
Sodium adsorption ratio: 0 to 13
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bt horizon
Hue: 10YR, 2.5Y, or 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 40 percent

Electrical conductivity: 4 to 8 mmhos/cm
Sodium adsorption ratio: 0 to 30
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 8.4

Byz1 horizon
Hue: 10YR, 2.5Y, or 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
Gypsum content: 1 to 6 percent
Sodium adsorption ratio: 13 to 40
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.6

Byz2 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 or 3
Textures: Clay, silty clay, or silty clay loam that is stratified with loam, clay loam, or silt loam
Clay content: 35 to 60 percent
Electrical conductivity: 16 to 30 mmhos/cm
Gypsum content: 1 to 6
Sodium adsorption ratio: 13 to 70
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.6

Owen Creek Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Mountains
Parent material: Material derived from shale
Slope range: 15 to 45 percent
Elevation range: 4,800 to 6,500 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Fine, smectitic Ustic Argicryolls

Typical Pedon

Owen Creek loam, 15 to 45 percent slopes, in an area of rangeland, 400 feet south and 2,500 feet east of the northwest corner of sec. 31, T. 19 N., R. 7 W.

A1—0 to 6 inches; dark gray (10YR 4/1) loam, black (10YR 2/1) moist; moderate very fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine and few medium roots; slightly acid; clear smooth boundary.

A2—6 to 14 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; moderate medium prismatic structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; slightly acid; clear smooth boundary.

Bt1—14 to 16 inches; gray (10YR 5/1) clay loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; common light gray (10YR 7/2) dry; silt and sand skeletans on faces of peds in upper part; 5 percent angular pebbles; slightly acid; clear smooth boundary.

Bt2—16 to 26 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; strong medium prismatic structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous distinct very dark grayish brown (2.5Y 3/2) moist; clay films on faces of peds; neutral; gradual smooth boundary.

Btk—26 to 37 inches; grayish brown (2.5Y 5/2) silty clay, olive gray (5Y 4/2) moist; moderate medium prismatic structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine tubular and interstitial pores; common distinct dark olive gray (5Y 3/2) clay films on faces of peds; few fine soft masses and seams of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—37 to 60 inches; light brownish gray (2.5Y 6/2) semiconsolidated shale that crushes to silty clay loam, dark grayish brown (2.5Y 4/2) moist; common faint lime coats on undersides of shale fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 35 to 40 degrees F
Depth to secondary lime: 15 to 34 inches
Depth to the paralithic contact: 20 to 40 inches

A horizons
Hue: 7.5YR, 10YR, or 2.5Y
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 1 to 3
Clay content: 15 to 27 percent
Content of rock fragments: 0 to 15 percent pebbles
Reaction: pH 6.6 to 7.8

Bt horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 1 to 3
Texture: Silty clay loam, clay loam, or silty clay
Clay content: 35 to 50 percent
Content of rock fragments: 0 to 15 percent hard pebbles; 0 to 15 percent soft pebbles
Reaction: pH 6.6 to 8.4

Btk horizon
Hue: 2.5Y or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Silty clay loam, clay loam, or silty clay
Clay content: 35 to 50 percent
Content of rock fragments: 0 to 15 percent hard pebbles; 0 to 15 percent soft pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

680E—Owen Creek-Cheadle complex, 15 to 45 percent slopes

Setting

Landform:
- Owen Creek—Mountains
- Cheadle—Mountains

Position on landform:
- Owen Creek—Backslopes
- Cheadle—Shoulders

Slope:
- Owen Creek—15 to 45 percent
- Cheadle—15 to 45 percent

Elevation: 4,800 to 6,500 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Owen Creek and similar soils: 75 percent
Cheadle and similar soils: 15 percent

Minor Components
Soils that have slopes more than 45 percent: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Soils with cobbly loam surface layers: 0 to 2 percent
Soils with stony loam surface layers: 0 to 2 percent
Soils with darker colored surface layers: 0 to 1 percent
Soils with hard bedrock at 30 inches: 0 to 1 percent

Major Component Description

Owen Creek
Surface layer texture: 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
Available water capacity: Mainly 6.3 inches

Cheadle
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite residuum
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.

Management

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

880E—Owen Creek loam, 15 to 45 percent slopes

Setting

Landform: Mountains
Slope: 15 to 45 percent
Elevation: 4,800 to 6,500 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Owen Creek and similar soils: 90 percent

Minor Components
Cheadle and similar soils: 0 to 2 percent
Leavitt and similar soils: 0 to 2 percent
Soils that have slopes more than 45 percent: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Soils with cobbly loam surface layers: 0 to 1 percent
Soils with stony loam surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: 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
Available water capacity: Mainly 6.3 inches

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

Management

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

980E—Owen Creek-Bridger stony loams, 15 to 35 percent slopes

Setting

Landform:
- Owen Creek—Mountains
- Bridger—Mountains

Slope:
- Owen Creek—15 to 35 percent
- Bridger—15 to 35 percent

Elevation: 4,800 to 6,500 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Owen Creek and similar soils: 55 percent
Bridger and similar soils: 35 percent

Minor Components
Cheadle and similar soils: 0 to 2 percent
Libeg and similar soils: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Soils with gravelly loam surface layers: 0 to 2 percent

Major Component Description

Owen Creek
Surface layer texture: Stony 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
Available water capacity: Mainly 5.8 inches

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

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

Management

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

Peeler Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Material derived from granitic rock
Slope range: 15 to 60 percent
Elevation range: 5,000 to 6,000 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Fine-loamy, mixed, superactive Ustic Glossocryalfs

Typical Pedon

Peeler very bouldery sandy loam, in an area of Peeler-Rock outcrop complex, 15 to 60 percent slopes, in an area of forestland, 900 feet south and 2,400 feet west of the northeast corner of sec. 21, T. 9 N., R. 4 W.

Oi—4 inches to 0; forest litter of partially decomposed needles and twigs; abrupt smooth boundary.
E—0 to 20 inches; light brownish gray (10YR 6/2) very bouldery sandy loam, dark grayish brown (10YR 4/2) moist; weak thin platy parting to weak fine and medium granular structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; slightly acid; clear smooth boundary.
E/Bt—20 to 23 inches; 80 percent pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist

(E part); 20 percent yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist (B part); moderate medium prismatic structure; slightly hard, friable, slightly sticky, nonplastic; common very fine and fine roots; many very fine tubular and interstitial pores; few faint clay films on faces of peds and bridging sand grains; 10 percent angular cobbles; neutral; gradual smooth boundary.

Bt/E—23 to 45 inches; 90 percent light yellowish brown (10YR 6/4) cobbly sandy clay loam, dark yellowish brown (10YR 4/4) moist (B part); 10 percent pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist (E part); moderate medium prismatic structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds and bridging sand grains; few discontinuous brown (7.5YR 5/4) layers of clay accumulations 1/4-inch thick; 5 percent stones and 25 percent cobbles; neutral; gradual smooth boundary.

Bt—45 to 52 inches; pale brown (10YR 6/3) cobbly sandy clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky, nonplastic; few very fine and fine roots; common very fine tubular and interstitial pores; common distinct yellowish brown (10YR 5/4) clay films on faces of peds and bridging sand grains; few discontinuous dark yellowish brown (10YR 3/4) moist, layers of clay accumulations 1/4-inch thick; 20 percent angular cobbles; neutral; gradual smooth boundary.

C—52 to 60 inches; grayish brown (2.5Y 5/2) cobbly sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose and nonsticky; few very fine and fine roots; 20 percent angular cobbles; neutral.

Range in Characteristics

Soil temperature: 36 to 42 degrees F

E horizon
- Hue: 10YR or 2.5Y
- Value: 5 to 8 dry; 3 to 7 moist
- Chroma: 1 to 4 or 6
- Clay content: 5 to 15 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 5.6 to 6.5

E/Bt and Bt/E horizons
- Hue: 10YR or 2.5Y
- Value: 5 to 8 dry; 3 to 7 moist
- Chroma: 1 to 4 or 6
- Clay content: 18 to 30 percent
- Reaction: pH 5.6 to 7.3

Bt horizon
- Hue: 10YR or 2.5Y
- Value: 5 to 7 dry; 4 to 6 moist
- Chroma: 1 to 4 or 6
- Clay content: 18 to 30 percent
- Reaction: pH 5.6 to 7.3

C horizon
- Hue: 2.5Y or 5Y
- Value: 4 to 6 dry; 3 or 4 moist
- Chroma: 2 or 3
- Clay content: 0 to 10 percent
- Gypsum content: 1 to 5 percent
- Reaction: pH 5.6 to 7.3

386E—Peeler stony sandy loam, 15 to 45 percent slopes

Setting

Landform: Mountains
Slope: 15 to 45 percent
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Peeler and similar soils: 95 percent

Minor Components
Soils with more rock fragments: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Surface layer texture: Stony sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from granitic rocks
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.6 inches

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

Management

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

486F—Peeler-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform: Mountains
Position on landform:
- Peeler—Backslopes
- Rock outcrop—Backslopes and shoulders

Slope: 15 to 60 percent
Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Peeler and similar soils: 80 percent
Rock outcrop: 10 percent

Minor Components
Moderately deep soils: 0 to 4 percent
Poorly drained soils: 0 to 2 percent
Areas of rubble land: 0 to 2 percent
Soils with stony sandy loam surfaces: 0 to 2 percent

Major Component Description

Peeler
Surface layer texture: Very bouldery sandy loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Material weathered from granitic rocks
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 6.6 inches

Rock outcrop
Definition: Hard granite bedrock

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

Management

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

Pensore Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and mountains
Parent material: Material derived from limestone
Slope range: 4 to 60 percent
Elevation range: 3,800 to 5,500 feet
Mean annual precipitation: 10 to 15 inches
Frost-free period: 90 to 120 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid Lithic Calciustepts

Typical Pedon

Pensore gravelly loam, in an area of Pensore-Rock outcrop complex, 15 to 60 percent slopes, in an area of rangeland, 400 feet south and 500 feet east of the northwest corner of sec. 30, T. 10 N., R. 4 W.

A—0 to 4 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 20 percent angular pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—4 to 15 inches; light gray (10YR 7/2) very gravelly loam, pale brown (10YR 6/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 15 percent angular cobbles and 45 percent angular pebbles; disseminated lime; continuous faint lime coats on coarse rock fragments; continuous thick lime casts on undersides of coarse rock fragments; violently effervescent; moderately alkaline.

R—15 inches; hard limestone bedrock with few fractures; few very fine roots in fractures.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to bedrock: 10 to 20 inches
Depth to the Bk horizon: 3 to 7 inches
Other features: When mixed to 7 inches, the A horizon will not meet the requirements for a mollic epipedon.

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 to 5 moist
Chroma: 1 to 3
Clay content: 10 to 25 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent stones and cobbles; 15 to 50 percent pebbles or channers
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

Bk horizon
Hue: 10YR or 2.5Y
Value: 7 or 8 dry; 6 or 7 moist
Chroma: 2 to 4
Clay content: 10 to 25 percent
Content of rock fragments: 35 to 60 percent—0 to 15 percent stones and cobbles; 35 to 55 percent pebbles or channers
Calcium carbonate equivalent: 40 to 60 percent, including coarse rock fragments less than 3/4-inch in size
Reaction: pH 7.9 to 8.4

241F—Pensore-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform: Hills
Position on landform:
• Pensore—Backslopes
• Rock outcrop—Backslopes and shoulders
Slope: 15 to 60 percent
Elevation: 3,800 to 5,500 feet
Mean annual precipitation: 10 to 15 inches
Frost-free period: 90 to 120 days

Composition

Major Components
Pensore and similar soils: 65 percent
Rock outcrop: 25 percent

Minor Components
Crago and similar soils: 0 to 4 percent
Very shallow soils: 0 to 3 percent
Moderately deep soils: 0 to 3 percent

Major Component Description

Pensore
Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

Rock outcrop
Definition: Hard limestone bedrock

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

Management

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

Perma Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate or moderate over rapid
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 2 to 15 percent
Elevation range: 4,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustolls

Typical Pedon

Perma gravelly loam, 2 to 15 percent slopes, in an area of cropland, 1,100 feet north and 2,450 feet west of the southeast corner of sec. 24, T. 12 N., R. 7 W.

Ap—0 to 6 inches, dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 15 percent angular pebbles; neutral; clear smooth boundary.
A2—6 to 10 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; many worm casts; 20 percent angular pebbles; neutral; clear smooth boundary.
A3—10 to 15 inches; dark brown (10YR 4/3) very gravelly loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 50 percent angular pebbles; neutral; clear smooth boundary.
Bw1—15 to 38 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; 65 percent angular pebbles; neutral; gradual smooth boundary.

Bw2—38 to 60 inches; light brown (7.5YR 6/4) extremely gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; few very fine roots; 70 percent angular pebbles; neutral.

Range in Characteristics

Soil temperature: 44 to 47 degrees F
Thickness of the mollic epipedon: 10 to 15 inches

A horizons
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 7 to 20 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent boulders, stones, and cobbles; 15 to 30 percent pebbles
Reaction: pH 6.6 to 7.3

Bw horizons
Hue: 10YR or 7.5YR
Value: 4 to 6 dry; 3 to 5 moist
Chroma: 2 to 4
Clay content: 7 to 15 percent
Content of rock fragments: 35 to 85 percent—0 to 50 percent stones and cobbles; 25 to 65 percent pebbles
Reaction: pH 6.6 to 7.8

188C—Perma gravelly loam, 2 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 15 percent
Elevation: 4,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Perma and similar soils: 95 percent

Minor Components
Shawmut and similar soils: 0 to 3 percent
Soils that have slopes more than 15 percent: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.3 inches

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

Management

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

500—Pits, gravel

Setting

Landform: Stream terraces
Elevation: 3,500 to 5,000 feet
Mean annual precipitation: 10 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components
Pits, gravel: 90 percent

Minor Components
Soils with loam textures: 0 to 10 percent

Major Component Description

Definition: An area mined as a source of sand and gravel
Dominant parent material: Alluvium

Reeder Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and sedimentary plains
Parent material: Material derived from semiconsolidated sandstone, mudstone, or siltstone
Slope range: 2 to 30 percent
Elevation range: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Reeder loam, in an area of Reeder-Regent-Cabba loams, 8 to 25 percent slopes, in an area of

rangeland, 140 feet north and 150 feet west of the southeast corner of sec. 4, T. 18 N., R. 4 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; slightly alkaline; clear smooth boundary.

Bt—4 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds; slightly alkaline; gradual smooth boundary.

Btk—9 to 16 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; common distinct dark brown (10YR 4/3) clay films on faces of peds; common fine seams and soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk1—16 to 22 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 15 percent flat soft sandstone fragments; continuous distinct lime casts on undersides of rock fragments; many fine seams and soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—22 to 28 inches; pale yellow (2.5Y 7/4) silt loam, olive brown (2.5Y 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 50 percent flat soft sandstone fragments; continuous distinct lime casts on undersides of rock fragments; many fine seams and soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Cr—28 to 60 inches; pale yellow (5Y 7/3) semiconsolidated sandstone, olive (5Y 4/4) moist; strongly effervescent.

Range in Characteristics

Soil temperature: 44 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Cr horizon: 20 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent
Reaction: pH 6.1 to 7.8

Bt horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 4 to 6 dry; 3 to 5 moist
Chroma: 2 to 4
Texture: Loam, sandy clay loam, or clay loam
Clay content: 18 to 35 percent
Reaction: pH 6.6 to 7.8

Btk and Bk horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 8 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loam, silt loam, silty clay loam, clay loam, or sandy clay loam
Clay content: 15 to 30 percent
Calcium carbonate equivalent: 15 to 20 percent
Reaction: pH 7.4 to 8.4

Cr horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 4 to 7 dry; 3 to 5 moist

280D—Reeder-Regent-Castner complex, 8 to 25 percent slopes

Setting

Landform:
- Reeder—Hills
- Regent—Hills
- Castner—Hills

Position on landform:
- Reeder—Backslopes and footslopes
- Regent—Backslopes and footslopes
- Castner—Shoulders

Slope:
- Reeder—8 to 25 percent
- Regent—8 to 25 percent
- Castner—8 to 25 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Reeder and similar soils: 50 percent
Regent and similar soils: 25 percent
Castner and similar soils: 15 percent

Minor Components
Soils that have slopes more than 25 percent: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Soils with hard bedrock at 5 to 10 inches: 0 to 2 percent
Shallow loam textured soils: 0 to 2 percent
Shallow clayey textured soils: 0 to 1 percent
Moderately sodic soils: 0 to 1 percent

Major Component Description

Reeder
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

Regent
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Castner
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
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.

Management

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

380C—Reeder-Regent-Cabba loams, 2 to 8 percent slopes

Setting

Landform:
- Reeder—Sedimentary plains
- Regent—Sedimentary plains
- Cabba—Sedimentary plains

Position on landform:
- Reeder—Backslopes and footslopes
- Regent—Backslopes and footslopes
- Cabba—Shoulders

Slope:
- Reeder—2 to 8 percent
- Regent—2 to 8 percent
- Cabba—2 to 8 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Reeder and similar soils: 45 percent
Regent and similar soils: 30 percent
Cabba and similar soils: 15 percent

Minor Components
Castner and similar soils: 0 to 2 percent
Poorly drained saline soils: 0 to 2 percent
Farnuf and similar soils: 0 to 2 percent
Shallow clayey soils: 0 to 2 percent
Soils that are moderately saline and sodic: 0 to 1 percent
Soils with silt loam surface layers: 0 to 1 percent

Major Component Description

Reeder
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

Regent
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
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: Sandstone 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.

Management

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

380D—Reeder-Regent-Cabba loams, 8 to 25 percent slopes

Setting

Landform:
- Reeder—Hills
- Regent—Hills
- Cabba—Hills

Position on landform:
- Reeder—Backslopes and footslopes
- Regent—Backslopes and footslopes
- Cabba—Shoulders

Slope:
- Reeder—8 to 25 percent
- Regent—8 to 25 percent
- Cabba—8 to 25 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Reeder and similar soils: 45 percent
Regent and similar soils: 30 percent
Cabba and similar soils: 15 percent

Minor Components
Castner and similar soils: 0 to 3 percent
Areas of rock outcrop: 0 to 3 percent
Soils with silt loam surface layers: 0 to 2 percent
Shallow clayey soils: 0 to 2 percent

Major Component Description

Reeder
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Regent
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
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: Sandstone 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.

Management

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

480D—Reeder-Castner complex, 4 to 25 percent slopes

Setting

Landform:
- Reeder—Hills
- Castner—Hills

Position on landform:
- Reeder—Backslopes
- Castner—Shoulders

Slope:
- Reeder—4 to 25 percent
- Castner—4 to 25 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Reeder and similar soils: 65 percent
Castner and similar soils: 25 percent

Minor Components
Regent and similar soils: 0 to 3 percent
Farnuf and similar soils: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Very shallow soils: 0 to 2 percent

Major Component Description

Reeder
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Castner
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
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.

Management

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

580E—Reeder-Castner-Rock outcrop complex, 8 to 45 percent slopes

Setting

Landform:
- Reeder—Hills
- Castner—Hills

Position on landform:
- Reeder—Backslopes
- Castner—Shoulders
- Rock outcrop—Shoulders

Slope:
- Reeder—8 to 25 percent
- Castner—8 to 45 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Reeder and similar soils: 60 percent
Castner and similar soils: 20 percent
Rock outcrop: 10 percent

Minor Components
Regent and similar soils: 0 to 3 percent
Very shallow soils: 0 to 3 percent
Shallow clayey soils: 0 to 2 percent
Shallow loam textured soils: 0 to 2 percent

Major Component Description

Reeder
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, loamy sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.5 inches

Castner
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

Rock outcrop
Definition: Hard sandstone bedrock

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

Management

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

Regent Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Hills and sedimentary plains
Parent material: Material derived from semiconsolidated shale and mudstone
Slope range: 2 to 35 percent
Elevation range: 3,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Fine, smectitic, frigid Vertic Argiustolls

Typical Pedon

Regent loam, in an area of Reeder-Regent-Cabba loams, 8 to 25 percent slopes, in an area of rangeland, 100 feet north and 200 feet west of the southeast corner of sec. 26, T. 18 N., R. 5 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine roots; slightly acid; clear smooth boundary.

Bt—4 to 10 inches; brown (10YR 5/3) silty clay, dark brown (10YR 3/3) moist; strong medium prismatic structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous distinct very dark grayish brown (10YR 3/2) moist clay films on faces of peds; neutral; gradual smooth boundary.

Btk—10 to 20 inches; light brownish gray (2.5Y 6/2) silty clay, grayish brown (2.5Y 5/2) moist; moderate medium prismatic parting to moderate medium angular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 5 percent pebbles; continuous faint lime coats on undersides of pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—20 to 30 inches; light olive gray (5Y 6/2) silty clay, olive (5Y 4/3) moist; massive; hard, firm, moderately sticky, moderately plastic; few very fine roots; 20 percent flat and angular shale chips; disseminated lime; continuous distinct lime coats on pebbles; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cr—30 to 60 inches; light olive gray (5Y 6/2) semiconsolidated shale and mudstone, olive gray (5Y 5/2) moist; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Cr horizon: 20 to 40 inches

A horizon
- Hue: 10YR or 2.5Y
- Value: 4 or 5 dry; 2 or 3 moist
- Chroma: 2 or 3
- Texture: Loam or clay loam
- Clay content: 18 to 40 percent
- Reaction: pH 6.1 to 7.8

Bt horizon
- Hue: 10YR, 2.5Y, or 5Y
- Value: 4 to 6 dry; 2 to 5 moist
- Chroma: 2 to 4
- Texture: Silty clay loam, clay, or silty clay
- Clay content: 35 to 50 percent
- Reaction: pH 7.4 to 9.0

Btk and Bk horizons
- Hue: 10YR, 2.5Y, or 5Y
- Value: 5 to 7 dry; 4 to 6 moist
- Chroma: 2 to 4
- Texture: Silty clay loam, clay loam, silty clay, or clay
- Clay content: 35 to 50 percent
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.4 to 9.0

Cr horizon
- Material: Semiconsolidated shale and mudstone

80C—Regent clay loam, 2 to 10 percent slopes

Setting

Landform: Hills
Slope: 2 to 10 percent
Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Regent and similar soils: 95 percent

Minor Components
Reeder and similar soils: 0 to 2 percent
Shallow clayey soils: 0 to 2 percent
Saline and sodic soils: 0 to 1 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

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

Management

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

178D—Regent-Reeder-Work stony loams, 4 to 30 percent slopes

Setting

Landform:
- Regent—Hills
- Reeder—Hills
- Work—Hills

Slope:
- Regent—4 to 30 percent
- Reeder—4 to 30 percent
- Work—4 to 30 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Regent and similar soils: 40 percent
Reeder and similar soils: 30 percent
Work and similar soils: 20 percent

Minor Components
Farnuf and similar soils: 0 to 5 percent
Shallow loamy soils: 0 to 5 percent

Major Component Description

Regent
Surface layer texture: Stony loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Reeder
Surface layer texture: Stony 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

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

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

Management

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

180D—Regent-Castner complex, 8 to 35 percent slopes

Setting

Landform:
- Regent—Hills
- Castner—Hills

Position on landform:
- Regent—Backslopes and footslopes
- Castner—Shoulders

Slope:
- Regent—8 to 25 percent
- Castner—8 to 35 percent

Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Regent and similar soils: 65 percent
Castner and similar soils: 20 percent

Minor Components
Reeder and similar soils: 0 to 3 percent
Hilger and similar soils: 0 to 3 percent
Shallow clayey soils: 0 to 3 percent
Soils that have slopes more than 35 percent: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Shallow loamy soils: 0 to 1 percent

Major Component Description

Regent
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Castner
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
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.

Management

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

278C—Regent-Auchard loams, 2 to 8 percent slopes

Setting

Landform:
- Regent—Sedimentary plains
- Auchard—Sedimentary plains

Slope:
- Regent—2 to 8 percent
- Auchard—2 to 8 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Regent and similar soils: 65 percent
Auchard and similar soils: 25 percent

Minor Components
Shallow soils: 0 to 3 percent
Poorly drained saline soils: 0 to 3 percent
Soils that have slopes more than 8 percent: 0 to 2 percent
Deep loamy soils: 0 to 2 percent

Major Component Description

Regent
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Auchard
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, clayey sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 5.0 inches

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

Management

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

479E—Regent-Wayden-Cabba complex, 15 to 45 percent slopes

Setting

Landform:
- Regent—Hills
- Wayden—Hills
- Cabba—Hills

Position on landform:
- Regent—Backslopes and footslopes
- Wayden—Backslopes and shoulders
- Cabba—Backslopes and shoulders

Slope:
- Regent—15 to 35 percent
- Wayden—15 to 45 percent
- Cabba—15 to 45 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Regent and similar soils: 45 percent
Wayden and similar soils: 30 percent
Cabba and similar soils: 20 percent

Minor Components
Farnuf and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Soils that have slopes more than 45 percent: 0 to 1 percent

Major Component Description

Regent
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Wayden
Surface layer texture: 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

Cabba
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 3.0 inches

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

Management

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

743D—Regent-Fairfield-Winspect stony loams, 8 to 35 percent slopes

Setting

Landform:
- Regent—Hills
- Fairfield—Moraines
- Winspect—Moraines

Position on landform:
- Regent—Backslopes and shoulders
- Fairfield—Footslopes
- Winspect—Backslopes and shoulders

Slope:
- Regent—8 to 25 percent
- Fairfield—8 to 25 percent
- Winspect—8 to 35 percent

Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Regent and similar soils: 40 percent
Fairfield and similar soils: 30 percent
Winspect and similar soils: 20 percent

Minor Components
Soils that have slopes more than 35 percent: 0 to 3 percent
Soils shallow to bedrock: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Soils with gravelly loam surface layers: 0 to 2 percent

Major Component Description

Regent
Surface layer texture: Stony loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Fairfield
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.1 inches

Winspect
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
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.

Management

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

780E—Regent-Sinnigam complex, 8 to 35 percent slopes

Setting

Landform:
- Regent—Hills
- Sinnigam—Hills

Position on landform:
- Regent—Backslopes and footslopes
- Sinnigam—Shoulders

Slope:
- Regent—8 to 25 percent
- Sinnigam—8 to 35 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Regent and similar soils: 60 percent
Sinnigam and similar soils: 30 percent

Minor Components
Work and similar soils: 0 to 2 percent
Reeder and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Moderately sodic soils: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 2 percent

Major Component Description

Regent
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

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

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

Management

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

879E—Regent-Wayden complex, 8 to 35 percent slopes

Setting

Landform:
- Regent—Hills
- Wayden—Hills

Position on landform:
- Regent—Backslopes and footslopes
- Wayden—Shoulders

Slope:
- Regent—8 to 25 percent
- Wayden—8 to 35 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Regent and similar soils: 65 percent
Wayden and similar soils: 30 percent

Minor Components
Farnuf and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 1 percent
Soils that have slopes more than 35 percent: 0 to 1 percent
Shallow loamy soils: 0 to 1 percent

Major Component Description

Regent
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Wayden
Surface layer texture: 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.

Management

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

979E—Regent-Lap complex, 8 to 45 percent slopes

Setting

Landform:
- Regent—Hills
- Lap—Hills

Position on landform:
- Regent—Backslopes
- Lap—Shoulders

Slope:
- Regent—8 to 45 percent
- Lap—8 to 45 percent

Elevation: 4,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Regent and similar soils: 65 percent
Lap and similar soils: 20 percent

Minor Components
Reeder and similar soils: 0 to 3 percent
Windham and similar soils: 0 to 3 percent
Soils that have slopes more than 45 percent: 0 to 3 percent
Areas of rock outcrop: 0 to 3 percent
Soils with stony loam surface layers: 0 to 2 percent
Shallow clayey soils: 0 to 1 percent

Major Component Description

Regent
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded shale and siltstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

Lap
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
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.

Management

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

Rittel Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Mountains
Parent material: Material derived from semiconsolidated shale
Slope range: 15 to 35 percent
Elevation range: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 20 inches
Frost-free period: 80 to 105 days

Taxonomic Class: Fine, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Rittel loam, in an area of Rittel-Tolex complex, 15 to 35 percent slopes, in an area of forestland, 1,350 feet north and 2,600 feet west of the southeast corner of sec. 9, T. 18 N., R. 7 W.

Oi—2 inches to 0; forest litter of partially decomposed needles, twigs, and roots; abrupt smooth boundary.
A—0 to 1 inch; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; moderate thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and common medium roots; 10 percent angular cobbles and pebbles; moderately acid; clear smooth boundary.
E—1 to 4 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; moderate very thin and thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and common medium and few coarse roots; 10 percent angular pebbles; moderately acid; clear smooth boundary.
Bt/E—4 to 8 inches; 90 percent is pale brown (10YR 6/3) silty clay, dark brown (10YR 4/3) moist (B part); 10 percent is light gray (10YR 7/2) loam, brown (10YR 5/3) moist (E part); strong fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and few medium and coarse roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 5 percent angular pebbles; slightly acid; abrupt smooth boundary.
Bt1—8 to 15 inches; pale brown (10YR 6/3) silty clay, dark grayish brown (10YR 4/2) moist; strong medium prismatic parting to strong medium and coarse subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine and few medium roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds; moderately acid; gradual smooth boundary.
Bt2—15 to 24 inches; light yellowish brown (2.5Y 6/4) silty clay, olive brown (2.5Y 4/4) moist; strong medium prismatic parting to strong medium and coarse subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine and few medium roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds; moderately acid; gradual smooth boundary.
Bt3—24 to 32 inches; light yellowish brown (2.5Y 6/4) silty clay, olive brown (2.5Y 4/4) moist; very hard, firm, moderately sticky, moderately plastic; common very fine and few medium roots; common very fine tubular and interstitial pores; many distinct clay films on faces of peds; moderately acid; gradual smooth boundary.
Cr—32 to 60 inches; light yellowish brown (2.5Y 6/4) and light brownish gray (2.5Y 6/2) semiconsolidated shale; slightly acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Cr material: 20 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 1 or 2
Clay content: 15 to 27 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent angular pebbles
Reaction: pH 5.6 to 6.5

E horizon
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent

Content of rock fragments: 0 to 20 percent—0 to 10 percent cobbles; 0 to 10 percent angular pebbles
Reaction: pH 5.6 to 6.5

Bt/E horizon
Hue: 10YR, 7.5YR, or 2.5YR
Value: B part—5 or 6 dry; 4 or 5 moist; E part—6 or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay loam, clay, or silty clay
Clay content: 27 to 45 percent (mixed)
Content of rock fragments: 0 to 20 percent pebbles
Reaction: pH 5.6 to 7.3

Bt horizons
Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay loam, clay, or silty clay
Clay content: 35 to 50 percent
Reaction: pH 5.6 to 7.3

95E—Rittel-Tolex complex, 15 to 35 percent slopes

Setting

Landform:
- Rittel—Mountains
- Tolex—Mountains

Position on landform:
- Rittel—Backslopes
- Tolex—Shoulders

Slope:
- Rittel—15 to 35 percent
- Tolex—15 to 35 percent

Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 20 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Rittel and similar soils: 70 percent
Tolex and similar soils: 20 percent

Minor Components
Wayden and similar soils: 0 to 4 percent
Reeder and similar soils: 0 to 3 percent
Soils that are very shallow to bedrock: 0 to 3 percent

Major Component Description

Rittel
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated shale residuum
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.4 inches

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

600—Riverwash

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,500 to 4,200 feet
Mean annual precipitation: 10 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components
Riverwash: 90 percent

Minor Components
Poorly drained soils: 0 to 5 percent
Soils with loamy surfaces: 0 to 5 percent

Major Component Description

Definition: Areas of recently deposited or flood water reworked alluvial material, supporting little or no vegetation
Flooding: Frequent

Rivra Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid to a depth of 6 inches and rapid below
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 3 percent
Elevation range: 3,500 to 5,400 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Aridic Ustifluvents

Typical Pedon

Rivra very gravelly loam, in an area of Ryell-Rivra complex, 0 to 3 percent slopes, in an area of rangeland, 1,600 feet south and 2,200 feet west of the northeast corner of sec. 1, T. 21 N., R. 7 W.

Ap—0 to 6 inches; light brownish gray (10YR 6/2) very gravelly loam, dark brown (10YR 4/3) moist; weak very thin platy parting to weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 10 percent cobbles and 25 percent pebbles; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.
C1—6 to 20 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, dark brown (10YR 4/3) moist; single grain; loose, slightly sticky, nonplastic; common very fine and few fine and medium roots; 20 percent cobbles and 50 percent pebbles; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.
C2—20 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly sand, dark brown (10YR 4/3) moist; single grain; loose; few very fine roots in upper part; 15 percent cobbles and 55 percent pebbles; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the seasonal high water table: 0 to 42 inches some time during the months of April, May, June, or July

Ap horizon
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 5 to 15 percent
Content of rock fragments: 35 to 60 percent—0 to 10 percent stones and cobbles; 15 to 50 percent pebbles
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 6.6 to 8.4

C horizons
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Sand or loamy sand that consists of strata of these and some finer sands
Clay content: 0 to 5 percent
Content of rock fragments: 55 to 80 percent—10 to 20 percent stones and cobbles; 45 to 70 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

40D—Rock outcrop-Rubble land

Setting

Landform:
- Rock outcrop—Mountains
- Rubble land—Mountains

Position on landform:
- Rock outcrop—Shoulders
- Rubble land—Backslopes and footslopes

Slope:
- Rubble land—35 to 80 percent
- *Elevation:* 4,500 to 7,000 feet

Composition

Major Components
Rock outcrop: 50 percent
Rubble land: 40 percent

Minor Components
Tolex and similar soils: 0 to 10 percent

Major Component Description

Rock outcrop
Definition: Exposures of argillite, limestone, and granite bedrock

Rubble land
Definition: Accumulations of loose rock below areas of rock outcrop

463F—Rock outcrop-Tolex complex, 25 to 80 percent slopes

Setting

Landform:
- Rock outcrop—Mountains
- Tolex—Mountains

Slope:
- Tolex—25 to 80 percent

Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Rock outcrop: 55 percent
Tolex and similar soils: 40 percent

Minor Components
Moderately deep soils: 0 to 5 percent

Major Component Description

Rock outcrop
Definition: Hard argillite bedrock

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

Rootel Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Bedrock-floored plains
Parent material: Material derived from calcareous argillite bedrock
Slope range: 2 to 8 percent
Elevation range: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Calciustepts

Typical Pedon

Rootel loam, in an area of Rootel-Musselshell loams, 2 to 8 percent slopes, in an area of rangeland, 1,500 feet north and 300 feet east of the southwest corner of sec. 14, T. 11 N., R. 5 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak thin platy parting to weak very fine granular structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine roots; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—4 to 11 inches; pale brown (10YR 6/3) loam, light yellowish brown (10YR 5/4) moist; weak medium prismatic parting to weak medium subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; common faint lime coats on faces of peds; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—11 to 25 inches; white (10YR 8/2) silt loam, light yellowish brown (10YR 6/4) moist; weak medium and coarse subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent channers; disseminated lime; common faint and distinct lime coats on faces of peds; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—25 to 36 inches; very pale brown (10YR 8/3) very channery loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; many fine and common very fine roots; many very fine tubular and interstitial pores; 5 percent flagstones and 30 percent channers; disseminated lime; common fine lime coats on surfaces of pebbles; violently effervescent; moderately alkaline; gradual smooth boundary.

R—36 inches; hard fractured calcareous argillite bedrock with few very fine roots extending into vertical cracks.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the R horizon: 20 to 40 inches

A horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 15 to 25 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bk1 horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 moist
Chroma: 2 to 4
Clay content: 18 to 27 percent
Calcium carbonate equivalent: 15 to 25 percent
Reaction: pH 7.9 to 9.0

Bk2 and Bk3 horizons
Hue: 10YR or 2.5Y
Value: 7 or 8 dry; 5 or 6 moist
Chroma: 2 to 4
Texture: Loam or silt loam
Clay content: 18 to 27 percent
Content of rock fragments: 5 to 35 percent—0 to 5 percent flagstones; 5 to 30 percent channers
Calcium carbonate equivalent: 25 to 35 percent
Reaction: pH 7.9 to 9.0

41C—Rootel-Musselshell loams, 2 to 8 percent slopes

Setting

Landform:
- Rootel—Bedrock-floored plains
- Musselshell—Alluvial fans

Slope:
- Rootel—2 to 8 percent
- Musselshell—2 to 8 percent

Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Rootel and similar soils: 55 percent
Musselshell and similar soils: 35 percent

Minor Components
Pensore and similar soils: 0 to 4 percent
Amesha and similar soils: 0 to 3 percent
Soils that have gravelly loam surface layers: 0 to 3 percent

Major Component Description

Rootel
Surface layer texture: Loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Argillite residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.8 inches

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

Management

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

Rothiemay Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 2 to 8 percent
Elevation range: 3,800 to 4,300 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Calciustolls

Typical Pedon

Rothiemay silt loam, 2 to 8 percent slopes, in an area of rangeland, 2,100 feet south and 50 feet west of the northeast corner of sec. 10, T. 20 N., R. 7 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, moderately sticky, slightly plastic; many very fine roots; slightly effervescent; slightly alkaline; gradual smooth boundary.
Bw—5 to 16 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; moderate medium prismatic structure; soft, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 2 percent pebbles; continuous fine lime casts on undersides of pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk1—16 to 50 inches; light gray (2.5Y 7/2) loam stratified with thin layers of silt loam, grayish brown (2.5Y 5/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; many fine seams and soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk2—50 to 60 inches; light gray (10YR 7/2) loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular and interstitial pores; disseminated lime; few fine seams and soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 10 inches
Depth to the calcic horizon: 13 to 20 inches

A horizon
Hue: 10YR or 2.5Y
Chroma: 1 or 2
Clay content: 15 to 27 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bw horizon
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam or clay loam
Clay content: 18 to 35 percent with less than 35 percent fine and coarser sand
Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles
Calcium carbonate equivalent: 5 to 20 percent
Reaction: pH 7.4 to 8.4

Bk horizons
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam, clay loam, or sandy clay loam
Clay content: 18 to 35 percent with less than 35 percent fine and coarser sand
Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles
Calcium carbonate equivalent: 15 to 40 percent
Reaction: pH 7.9 to 8.4

136C—Rothiemay silt loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 3,800 to 4,300 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Rothiemay and similar soils: 95 percent

Minor Components
Sappington and similar soils: 0 to 2 percent
Soils that have slopes more than 8 percent: 0 to 2 percent
Soils with gravelly silt loam surfaces: 0 to 1 percent

Major Component Description

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

Management

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

Ryell Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 35 inches and rapid below
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 3 percent
Elevation range: 3,500 to 5,400 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, frigid Aridic Ustifluvents

Typical Pedon

Ryell loam, in an area of Ryell-Rivra complex, 0 to 3 percent slopes, in an area of cropland, 1,800 feet south and 1,600 feet west of the northeast corner of sec. 1, T. 21 N., R. 7 W.

Ap—0 to 6 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

C1—6 to 16 inches; light brownish gray (2.5Y 6/2) loam, with thin strata of silt loam, dark grayish brown (2.5Y 4/2) moist; massive; many distinct bedding planes; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—16 to 23 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; slightly alkaline; gradual smooth boundary.

C3—23 to 35 inches; pale brown (10YR 6/3) sandy loam with thin strata of loam, dark brown (10YR 5/4) moist; few fine distinct reddish yellow (7.5YR 6/6) mottles; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; disseminated lime; strongly effervescent; slightly alkaline; clear smooth boundary.

2C4—35 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly sand, dark brown (10YR 4/3) moist; single grain; loose; 15 percent cobbles and 45 percent pebbles; disseminated lime; strongly effervescent; mildly alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the 2C horizon: 18 to 36 inches

Ap horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 10 to 27 percent
Electrical conductivity: 0 to 2 mmhos/cm
Effervescence: None to strongly
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 7.4 to 8.4

C horizons
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Very fine sandy loam, loamy very fine sand, or loam consisting of very fine sandy loam with thin strata of loam, silt loam, and/or fine sandy loam
Clay content: 10 to 18 percent
Content of rock fragments: 0 to 5 percent pebbles
Electrical conductivity: 0 to 2 mmhos/cm
Effervescence: Slightly or strongly
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

2C4 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Sand or loamy sand
Clay content: 0 to 10 percent
Content of rock fragments: 35 to 70 percent—0 to 15 percent cobbles; 35 to 55 percent pebbles
Electrical conductivity: 0 to 4 mmhos/cm
Effervescence: Slightly or strongly
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

117A—Ryell-Rivra complex, 0 to 3 percent slopes

Setting

Landform:
- Ryell—Flood plains
- Rivra—Flood plains

Slope:
- Ryell—0 to 3 percent
- Rivra—0 to 3 percent

Elevation: 3,500 to 5,400 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Ryell and similar soils: 55 percent
Rivra and similar soils: 35 percent

Minor Components
Havre and similar soils: 0 to 3 percent
Poorly drained soils: 0 to 3 percent
Soils with very cobbly loam surfaces: 0 to 2 percent
Soils that have slopes more than 3 percent: 0 to 2 percent

Major Component Description

Ryell
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Available water capacity: Mainly 6.6 inches

Rivra
Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional
Depth to the seasonal high water table: Apparent, 0 to 42 inches
Available water capacity: Mainly 1.8 inches

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

Management

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

212A—Ryell loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Ryell and similar soils: 90 percent

Minor Components
Havre and similar soils: 0 to 5 percent
Soils that are shallow to sand and gravel: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Available water capacity: Mainly 6.6 inches

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

Management

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

Sappington Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 1 to 8 percent
Elevation range: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Calcidic Argiustolls

Typical Pedon

Sappington loam, in an area of Sappington-Amesha loams, 1 to 4 percent slopes, in an area of cropland, 50 feet north and 2,450 feet east of the southwest corner of sec. 27, T. 10 N., R. 2 W.

Ap—0 to 4 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common

very fine and fine roots; 1 percent pebbles; slightly alkaline; abrupt smooth boundary.

Bt—4 to 6 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic parting to moderate fine angular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds; 1 percent pebbles; slightly alkaline; abrupt smooth boundary.

Btk—6 to 9 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; moderate medium prismatic structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; many very fine and fine tubular and interstitial pores; few distinct clay films on faces of peds; 1 percent pebbles; common distinct lime coats on faces of peds; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk1—9 to 20 inches; white (10YR 8/2) loam, very pale brown (10YR 7/3) moist; weak coarse prismatic structure; hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; 1 percent pebbles; disseminated lime; many distinct lime coats on faces of peds; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—20 to 34 inches; very pale brown (10YR 8/3) loam, very pale brown (10YR 6/3) moist; weak coarse angular blocky structure; hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine and fine tubular and interstitial pores; 2 percent pebbles; disseminated lime; few fine soft masses of lime; few distinct lime coats on faces of peds; violently effervescent; moderately alkaline; clear smooth boundary.

Bk3—34 to 72 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; massive; hard, very friable, slightly sticky, slightly plastic; few very fine roots; few very fine tubular and interstitial pores; 2 percent pebbles; few fine soft masses of lime; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

Thickness of the mollic epipedon: 7 to 9 inches; includes part of the Bt horizon

Depth to lime: 6 to 10 inches

Ap horizon

Hue: 7.5YR or 10YR
Value: 4 or 5 dry; 3 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent
Content of rock fragments: 0 to 30 percent—0 to 5 percent cobbles; 0 to 25 percent pebbles
Reaction: pH 6.6 to 7.8

Bt horizon

Hue: 7.5YR or 10YR
Value: 4 or 5 dry; 3 or 4 moist
Chroma: 3 or 4
Clay content: 27 to 35 percent
Content of rock fragments: 0 to 25 percent pebbles
Reaction: pH 6.6 to 7.8

Btk horizon

Hue: 7.5YR or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam or sandy loam
Clay content: 15 to 27 percent (10 to 18 percent noncarbonate clay)
Content of rock fragments: 0 to 25 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Bk1 and Bk2 horizons

Hue: 7.5YR, 10YR, or 2.5Y
Value: 7 or 8 dry; 5 to 7 moist
Chroma: 2 or 3
Texture: Loam or sandy loam
Clay content: 15 to 27 percent (10 to 18 percent noncarbonate clay)
Content of rock fragments: 0 to 25 percent pebbles
Calcium carbonate equivalent: 20 to 40 percent
Reaction: pH 7.9 to 8.4

Bk3 horizon

Hue: 7.5YR, 10YR, or 2.5Y
Value: 6 or 7 dry; 5 or 6 moist
Chroma: 2 or 3
Texture: Loam or sandy loam
Clay content: 15 to 27 percent (10 to 18 percent noncarbonate clay)
Content of rock fragments: 0 to 25 percent pebbles
Calcium carbonate equivalent: 20 to 40 percent
Reaction: pH 7.9 to 8.4

33B—Sappington-Amesha loams, 1 to 4 percent slopes

Setting

Landform:
- Sappington—Alluvial fans
- Amesha—Alluvial fans

Slope:
- Sappington—1 to 4 percent
- Amesha—1 to 4 percent

Elevation: 3,800 to 4,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Sappington and similar soils: 60 percent
Amesha and similar soils: 35 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 3 percent
Very deep gravelly loam soils: 0 to 2 percent

Major Component Description

Sappington
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 8.2 inches

Amesha
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

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

Management

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

33C—Sappington-Amesha loams, 4 to 8 percent slopes

Setting

Landform:
- Sappington—Alluvial fans
- Amesha—Alluvial fans

Position on landform:
- Sappington—Backslopes and footslopes
- Amesha—Shoulders

Slope:
- Sappington—4 to 8 percent
- Amesha—4 to 8 percent

Elevation: 3,800 to 4,300 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Sappington and similar soils: 50 percent
Amesha and similar soils: 40 percent

Minor Components
Soils that have slopes more than 8 percent: 0 to 4 percent
Soils with gravelly loam surface layers: 0 to 4 percent
Very gravelly loam soils: 0 to 2 percent

Major Component Description

Sappington
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 8.2 inches

Amesha
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

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

Management

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

533B—Sappington-Musselshell gravelly loams, 2 to 8 percent slopes

Setting

Landform:
- Sappington—Alluvial fans
- Musselshell—Alluvial fans

Slope:
- Sappington—2 to 8 percent
- Musselshell—2 to 8 percent

Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Sappington and similar soils: 50 percent
Musselshell and similar soils: 40 percent

Minor Components
Soils with very gravelly loam surfaces: 0 to 5 percent
Soils with more rock fragments: 0 to 5 percent

Major Component Description

Sappington
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 8.0 inches

Musselshell
Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.5 inches

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

Management

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

Sawbuck Series

Depth class: Very deep (more than 60 inches) or deep (40 to 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium from igneous and sedimentary rock
Slope range: 15 to 60 percent
Elevation range: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 24 inches
Frost-free period: 80 to 105 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Sawbuck loam, 15 to 45 percent slopes, in an area of forestland, 1,400 feet north and 1,300 feet east of the southwest corner of sec. 4, T. 14 N., R. 2 W.

Oi—1 inch to 0; forest litter of partially decomposed twigs and needles.
A1—0 to 6 inches; gray (10YR 5/1) loam, very dark gray (10YR 3/1) moist; moderate very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium and coarse roots; 5 percent angular pebbles; slightly acid; gradual smooth boundary.
A2—6 to 9 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium and coarse roots; many gray silt and sand skeletans on faces of peds; 5 percent angular pebbles; moderately acid; gradual smooth boundary.
Bt1—9 to 15 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; common distinct dark brown (10YR 3/3) moist clay films on faces of peds; many faint gray silt and sand skeletans on faces of peds; 5 percent angular cobbles and 25 percent angular pebbles; moderately acid; clear smooth boundary.
Bt2—15 to 40 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 4/3) moist; strong fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine and few

medium roots; common very fine and fine tubular and interstitial pores; many distinct dark brown (10YR 3/3) moist clay films on faces of peds and lining pores; 5 percent angular cobbles and 45 percent angular pebbles; moderately acid; gradual smooth boundary.

Bt3—40 to 48 inches; light gray (2.5Y 7/2) very gravelly silty clay loam, grayish brown (2.5Y 5/2) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; many faint light gray (2.5Y 7/2) silt and sand skeletans on faces of peds; common distinct pale yellow (2.5Y 7/4) stains on faces of peds and on coarse rock fragments; 5 percent angular cobbles and 40 percent angular pebbles; moderately acid; gradual smooth boundary.

Bt4—48 to 60 inches; light brownish gray (2.5Y 6/2) gravelly silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; few very fine roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; common distinct pale yellow (2.5Y 7/4) stains on faces of peds and on coarse rock fragments; 15 percent angular sandstone and shale fragments; moderately acid.

Range in Characteristics

Soil temperature: 40 to 45 degrees F
Thickness of the mollic epipedon: 10 to 15 inches
Depth to the argillic horizon: 5 to 16 inches
Soil phases: Shale substratum

A horizons
- Value: 4 or 5 dry; 3 moist
- Chroma: 1 or 2
- Clay content: 10 to 20 percent
- Content of rock fragments: 0 to 15 percent—0 to 5 percent stones; 0 to 5 percent angular cobbles; 0 to 5 percent angular pebbles
- Reaction: pH 5.6 to 6.5

Bt1 horizon
- Hue: 10YR or 2.5Y
- Value: 5 or 6 dry; 3 or 4 moist
- Chroma: 2 or 3
- Texture: Clay loam or loam
- Clay content: 25 to 30 percent
- Content of rock fragments: 15 to 35 percent—5 to 10 percent angular cobbles; 10 to 35 percent angular pebbles
- Reaction: pH 5.6 to 6.5

Bt2 and Bt3 horizons
- Hue: 10YR or 2.5Y
- Value: 5 to 7 dry; 4 or 5 moist
- Chroma: 2 to 4
- Texture: Clay loam or silty clay loam
- Clay content: 27 to 35 percent
- Content of rock fragments: 35 to 60 percent—5 to 10 percent angular cobbles; 30 to 50 percent angular pebbles
- Reaction: pH 5.6 to 6.5

Bt4 horizon
- Hue: 10YR or 2.5Y
- Value: 5 to 7 dry; 4 or 5 moist
- Chroma: 2 to 4
- Texture: Silty clay loam or clay loam
- Clay content: 27 to 35 percent
- Content of rock fragments: 15 to 60 percent—5 to 10 percent angular cobbles; 10 to 50 percent angular pebbles
- Reaction: pH 5.6 to 6.5

71E—Sawbuck loam, 15 to 45 percent slopes

Setting

Landform: Mountains
Slope: 15 to 45 percent
Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 24 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Sawbuck and similar soils: 90 percent

Minor Components
Soils with bedrock at less than 40 inches: 0 to 3 percent
Soils that have slopes more than 45 percent: 0 to 3 percent
Soils with stony surface layers: 0 to 2 percent
Soils with less rock fragments: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Igneous colluvium
Native plant cover type: Forestland
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.

Management

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

171E—Sawbuck-Tolex complex, 15 to 45 percent slopes

Setting

Landform:
- Sawbuck—Mountains
- Tolex—Mountains

Position on landform:
- Sawbuck—Backslopes
- Tolex—Shoulders

Slope:
- Sawbuck—15 to 45 percent
- Tolex—14 to 45 percent

Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 24 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Sawbuck and similar soils: 70 percent
Tolex and similar soils: 20 percent

Minor Components
Very shallow soils: 0 to 4 percent
Areas of rock outcrop: 0 to 3 percent
Extremely gravelly deep soils: 0 to 3 percent

Major Component Description

Sawbuck
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Igneous colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 7.1 inches

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

271F—Sawbuck-Sawbuck, shale substratum, loams, 25 to 60 percent slopes

Setting

Landform:
- Sawbuck—Mountains
- Sawbuck—Mountains

Slope:
- Sawbuck—25 to 60 percent
- Sawbuck—25 to 60 percent

Elevation: 5,000 to 5,500 feet
Mean annual precipitation: 15 to 24 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Sawbuck and similar soils: 45 percent
Sawbuck and similar soils: 40 percent

Minor Components
Tolex and similar soils: 0 to 5 percent
Soils with shale at less than 40 inches: 0 to 4 percent
Soils with less rock fragments: 0 to 3 percent
Soils that have slopes less than 25 percent: 0 to 3 percent

Major Component Description

Sawbuck
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Igneous colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 7.1 inches

Sawbuck
Surface layer texture: Loam
Depth class: Deep (40 to 60 inches)
Drainage class: Well drained
Dominant parent material: Shale residuum

Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

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

Management

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

Scravo Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 6 inches, moderately rapid from 6 to 17 inches, and rapid below
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Aridic Calciustepts

Typical Pedon

Scravo gravelly loam, 0 to 2 percent slopes, in an area of cropland, 250 feet north and 50 feet east of the southwest corner of sec. 19, T. 11 N., R. 3 W.

Ap—0 to 6 inches; light brownish gray (10YR 6/2) gravelly loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; 20 percent pebbles; continuous prominent lime casts on undersides of pebbles; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk1—6 to 17 inches; light gray (10YR 7/2) extremely gravelly sandy loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots; 65 percent pebbles; many fine soft masses of lime; continuous prominent lime casts on undersides of pebbles; violently effervescent; moderately alkaline; clear wavy boundary.

2Bk2—17 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose; few very fine roots; 65 percent pebbles; common prominent lime an silica casts on undersides of pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the Bk horizon: 3 to 6 inches
Depth to the 2Bk horizon: 9 to 20 inches

Ap horizon
- Hue: 10YR or 2.5Y
- Value: 5 to 7 dry; 4 to 6 moist
- Chroma: 2 or 3
- Clay content: 15 to 25 percent
- Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 7.4 to 7.8

Bk1 horizon
- Hue: 10YR or 2.5Y
- Value: 6 to 8 dry; 4 to 6 moist
- Chroma: 2 or 3
- Texture: Sandy loam or loam
- Clay content: 5 to 15 percent
- Content of rock fragments: 35 to 70 percent—0 to 10 percent cobbles; 35 to 65 percent pebbles
- Electrical conductivity: 0 to 2 mmhos/cm
- Calcium carbonate equivalent: 15 to 40 percent
- Reaction: pH 7.9 to 8.4

2Bk2 horizon
- Hue: 10YR or 2.5Y
- Value: 6 to 8 dry; 4 to 6 moist
- Chroma: 2 or 3
- Texture: Loamy sand or sand
- Clay content: 0 to 10 percent
- Content of rock fragments: 35 to 80 percent—0 to 15 percent cobbles; 35 to 65 percent pebbles
- Electrical conductivity: 0 to 2 mmhos/cm
- Calcium carbonate equivalent: 10 to 30 percent
- Reaction: pH 7.9 to 8.4

9A—Scravo gravelly loam, 0 to 2 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 2 percent
Elevation: 3,600 to 4,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Scravo and similar soils: 90 percent

Minor Components
Nippt and similar soils: 0 to 7 percent
Soils with loam surface layers: 0 to 3 percent

Major Component Description

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 2.6 inches

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

Management

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

Shadow Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Mountains
Parent material: Colluvium derived from argillite and igneous rock
Slope range: 25 to 60 percent
Elevation range: 6,500 to 7,800 feet
Mean annual Precipitation: 25 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Ustic Eutrocryepts

Typical Pedon

Shadow channery loam, in an area of Shadow-Cowood complex, 25 to 60 percent slopes, in an area of forestland, 2,100 feet north and 1,900 feet west of the southeast corner of sec. 19, T. 14 N., R. 5 W.

Oi—2 inches to 0; forest litter of partially decomposed needles, twigs, and roots; abrupt smooth boundary.
A—0 to 3 inches; light brownish gray (10YR 6/2) channery loam, dark brown (10YR 4/3) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many gray silt and sand skeletans on faces of peds; 20 percent channers; strongly acid; clear smooth boundary.
E1—3 to 8 inches; pale brown (10YR 6/3) very channery loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and common medium roots; many very fine tubular and interstitial pores; many gray silt and sand skeletans on faces of peds; 50 percent channers; strongly acid; gradual smooth boundary.
E2—8 to 25 inches; pale brown (10YR 6/3) extremely channery sandy loam, dark brown (10YR 4/3) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; 10 percent flagstones and 60 percent channers; rock fragments coated with gray silt and sand skeletans; strongly acid; clear wavy boundary.
Bw—25 to 40 inches; pinkish gray (7.5YR 6/2) extremely channery loam, dark brown (7.5YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; few faint clay films on faces of peds; common faint gray silt and sand skeletans on faces of ped; 5 percent flagstones and 60 percent channers; strongly acid; gradual wavy boundary.
BC1—40 to 50 inches; pinkish gray (7.5YR 6/2) extremely channery sand, dark brown (7.5YR 4/2) moist; single grain; loose, nonsticky, nonplastic; few very fine roots; 75 percent channers coated with few faint gray silt and sand grains; strongly acid; clear smooth boundary.
BC2—50 to 60 inches; brown (7.5YR 5/2) extremely channery sandy loam, dark brown (7.5YR 4/2) moist; weak fine and medium subangular blocky parting to weak fine and medium granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine interstitial pores; 5 percent flagstones and 60 percent channers; strongly acid.

Range in Characteristics

Soil temperature: 38 to 44 degrees F
Base saturation: 50 to 100 percent

A horizon
Hue: 7.5YR or 10YR
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 5 to 15 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent stones and flagstones; 15 to 30 percent channers
Reaction: pH 5.1 to 6.0

E horizons
Hue: 10YR or 7.5YR
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Sandy loam or loam
Clay content: 5 to 15 percent—55 to 80 percent sand of which 5 to 15 percent is very fine sand and 15 to 40 percent is mica
Content of rock fragments: 40 to 70 percent—0 to 10 percent flagstones; 40 to 60 percent channers
Reaction: pH 5.1 to 6.0

Bw horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Sandy loam or loam
Clay content: 5 to 15 percent—55 to 80 percent sand of which 5 to 15 percent is very fine sand and 15 to 40 percent is mica
Content of rock fragments: 60 to 80 percent—0 to 10 percent flagstones; 60 to 70 percent channers
Reaction: pH 5.1 to 6.0

BC horizons
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Sand or sandy loam
Clay content: 5 to 15 percent—55 to 80 percent sand of which 5 to 15 percent is very fine sand and 15 to 40 percent is mica
Content of rock fragments: 60 to 85 percent—0 to 10 percent flagstones; 60 to 75 percent channers
Reaction: pH 5.1 to 6.0

190F—Shadow-Cowood complex, 25 to 60 percent slopes

Setting

Landform:
- Shadow—Mountains
- Cowood—Mountains

Position on landform:
- Shadow—Backslopes and footslopes
- Cowood—Shoulders

Slope:
- Shadow—25 to 60 percent
- Cowood—25 to 60 percent

Elevation: 6,500 to 7,800 feet
Mean annual precipitation: 25 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Shadow and similar soils: 80 percent
Cowood and similar soils: 15 percent

Minor Components
Very shallow soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Soils with stony loam surface layers: 0 to 1 percent

Major Component Description

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

Cowood
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.0 inches

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

Management

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

Shawa Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 8 to 15 percent
Elevation range: 3,600 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Pachic Haplustolls

Typical Pedon

Shawa loam, in an area of Shawa-Castner-Rock outcrop complex, 8 to 45 percent slopes, in an area of rangeland, 800 feet north and 1,500 feet west of the southeast corner of sec. 13, T. 15 N., R. 3 W.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; moderate very thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; neutral; clear smooth boundary.

A2—5 to 12 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic parting to weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; neutral; clear smooth boundary.

A3—12 to 18 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak medium prismatic parting to weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; neutral; clear smooth boundary.

Bw—18 to 27 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium prismatic parting to weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; neutral; clear smooth boundary.

Bk—27 to 50 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; common very fine tubular and interstitial pores; common fine soft masses and threads of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C—50 to 60 inches; olive gray (5Y 5/2) gravelly sandy loam, olive gray (5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; 15 percent pebbles; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Thickness of the mollic epipedon: 16 to 25 inches

A horizons
- Hue: 7.5YR, 10YR, 2.5Y, or 5Y
- Value: 3 to 5 dry; 2 or 3 moist
- Chroma: 1 to 3
- Clay content: 18 to 25 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 6.6 to 7.8

Bw horizon
- Hue: 10YR or 2.5Y
- Value: 5 or 6 dry; 4 or 5 moist
- Chroma: 2 or 3
- Texture: Loam or clay loam
- Clay content: 18 to 35 percent
- Content of rock fragments: 0 to 15 percent pebbles
- 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 or 3
- Texture: Sandy loam or loam
- Clay content: 15 to 25 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 7.4 to 8.4

C horizon
- Hue: 2.5Y or 5Y
- Value: 5 to 7 dry; 3 or 4 moist
- Chroma: 1 to 3
- Texture: Loam or sandy loam
- Clay content: 10 to 20 percent

Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 3 to 10 percent
Reaction: pH 7.4 to 8.4

88B—Shawa loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 3,600 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Shawa and similar soils: 95 percent

Minor Components
Farnuf and similar soils: 0 to 2 percent
Soils with more rock fragments: 0 to 1 percent
Soils that have slopes more than 8 percent: 0 to 1 percent
Very deep sandy loam soils: 0 to 1 percent

Major Component Description

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

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

Management

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

161E—Shawa-Castner-Rock outcrop complex, 8 to 45 percent slopes

Setting

Landform:
- Shawa—Alluvial fans
- Castner—Hills

Position on landform:
- Shawa—Footslopes and toeslopes
- Castner—Backslopes and shoulders
- Rock outcrop—Backslopes and shoulders

Slope:
- Shawa—8 to 15 percent
- Castner—8 to 45 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Shawa and similar soils: 40 percent
Castner and similar soils: 35 percent
Rock outcrop: 15 percent

Minor Components
Soils with extremely channery subsoils: 0 to 5 percent
Moderately deep soils: 0 to 5 percent

Major Component Description

Shawa
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

Castner
Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

Rock outcrop
Definition: Hard igneous bedrock

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

Management

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

861D—Shawa-Farnuf-Castner complex, 4 to 25 percent slopes

Setting

Landform:
- Shawa—Alluvial fans
- Farnuf—Alluvial fans
- Castner—Hills

Position on landform:
- Shawa—Footslopes and toeslopes
- Farnuf—Footslopes and toeslopes
- Castner—Backslopes and shoulders

Slope:
- Shawa—4 to 15 percent
- Farnuf—4 to 15 percent
- Castner—8 to 25 percent

Elevation: 3,600 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Shawa and similar soils: 40 percent
Farnuf and similar soils: 30 percent
Castner and similar soils: 20 percent

Minor Components
Areas of rock outcrop: 0 to 5 percent
Moderately deep soils: 0 to 5 percent

Major Component Description

Shawa
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

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

Castner
Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Igneous residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.3 inches

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

Management

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

Shawmut Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 1 to 25 percent
Elevation range: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Shawmut gravelly loam, 2 to 8 percent slopes, in an area of rangeland, 1,300 feet north and 200 feet west of the southeast corner of sec. 1, T. 19 N., R. 8 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 30 percent pebbles; slightly alkaline; clear smooth boundary.

Bt1—4 to 9 inches; dark grayish brown (10YR 4/2) very gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds and on fragments; 45 percent pebbles; slightly alkaline; clear smooth boundary.

Bt2—9 to 15 inches; brown (10YR 5/3) very gravelly clay loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 50 percent pebbles; slightly alkaline; clear smooth boundary.

Btk—15 to 20 inches; pale brown (10YR 6/3) extremely gravelly loam, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; few faint clay films on faces of peds; 60 percent pebbles; continuous distinct lime casts on undersides of pebbles; disseminated lime; common fine seams and soft masses of lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk1—20 to 45 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; 70 percent pebbles; continuous distinct lime casts on undersides of pebbles; common fine soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

2Bk2—45 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, very friable, nonsticky, nonplastic; 70 percent pebbles; continuous faint lime casts on undersides of pebbles; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the calcic horizon: 9 to 20 inches

A horizon
Hue: 7.5YR or 10YR
Value: 3 or 4 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent
Content of rock fragments: 15 to 60 percent—0 to 10 percent cobbles; 15 to 50 percent pebbles
Reaction: pH 6.6 to 7.8

Bt1 horizon
Hue: 7.5YR or 10YR
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 2 or 3
Texture: Sandy clay loam or clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 35 to 60 percent—0 to 10 percent cobbles; 35 to 50 percent pebbles
Reaction: pH 6.6 to 7.8

Bt2 horizon
Hue: 7.5YR or 10YR
Value: 3 to 5 dry; 2 to 4 moist
Chroma: 2 or 3
Texture: Sandy clay loam or clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 35 to 80 percent—0 to 15 percent stones; 0 to 20 percent cobbles; 30 to 60 percent pebbles
Reaction: pH 7.9 to 8.4

Btk horizon
Hue: 7.5YR or 10YR
Value: 3 to 6 dry; 2 to 5 moist
Chroma: 2 or 3
Texture: Clay loam, loam, or sandy loam
Clay content: 18 to 35 percent
Content of rock fragments: 35 to 80 percent—0 to 20 percent stones; 0 to 20 percent cobbles; 30 to 60 percent pebbles
Calcium carbonate equivalent: 15 to 30 percent
Reaction: pH 7.9 to 8.4

Bk1 horizon
Hue: 2.5Y or 10YR
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Sandy loam, clay loam, or loam
Clay content: 15 to 30 percent
Content of rock fragments: 35 to 80 percent—0 to 20 percent stones; 0 to 20 percent cobbles; 30 to 75 percent pebbles
Calcium carbonate equivalent: 15 to 30 percent
Reaction: pH 7.9 to 8.4

2Bk2 horizon
Hue: 2.5Y or 10YR
Value: 5 to 8 dry; 4 to 7 moist
Chroma: 2 or 3
Texture: Sandy loam, loamy sand, or loam
Clay content: 5 to 25 percent
Content of rock fragments: 50 to 85 percent—0 to 20 percent stones; 0 to 20 percent cobbles; 45 to 70 percent pebbles
Calcium carbonate equivalent: 10 to 25 percent
Electrical conductivity: Less than 2 mmhos/cm
Reaction: pH 7.9 to 9.0

154D—Shawmut-Beaverton very gravelly loams, 8 to 25 percent slopes

Setting

Landform:
- Shawmut—Stream terraces
- Beaverton—Stream terraces

Slope:
Shawmut—8 to 25 percent
Beaverton—8 to 25 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Shawmut and similar soils: 70 percent
Beaverton and similar soils: 20 percent

Minor Components
Soils that have slopes more than 25 percent: 0 to 3 percent
Soils with cobbly loam surface layers: 0 to 3 percent
Soils with stony loam surface layers: 0 to 2 percent
Soils that are calcareous throughout: 0 to 2 percent

Major Component Description

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

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

Management

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

167C—Shawmut gravelly loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Shawmut and similar soils: 90 percent

Minor Components
Beaverton and similar soils: 0 to 4 percent
Soils that have slopes more than 8 percent: 0 to 3 percent
Soils with very gravelly loam surfaces: 0 to 3 percent

Major Component Description

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 4.7 inches

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

Management

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

Sieben Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans and mountains
Parent material: Alluvium, colluvium from argillite, and igneous rock
Slope range: 2 to 35 percent
Elevation range: 4,000 to 5,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Calcidic Argiustolls

Typical Pedon

Sieben gravelly loam, 2 to 8 percent slopes, in an area of rangeland, 1,900 feet south and 50 feet east of the northwest corner of sec. 15, T. 13 N., R. 4 W.

A1—0 to 5 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine

roots; 20 percent angular pebbles; slightly acid; clear smooth boundary.

A2—5 to 9 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic parting to moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; 20 percent angular pebbles; slightly acid; clear smooth boundary.

Bt1—9 to 17 inches; pale brown (10YR 6/3) very gravelly clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic parting to moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct brown (10YR 5/3) clay films on faces of peds; 45 percent angular pebbles; slightly acid; gradual smooth boundary.

Bt2—17 to 21 inches; pale brown (10YR 6/3) very gravelly loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; few faint clay films on faces of peds and on coarse rock fragments; 5 percent angular cobbles and 55 percent angular pebbles; few faint lime casts on undersides of coarse rock fragments; slightly alkaline; gradual smooth boundary.

Bk1—21 to 30 inches; very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 10 percent angular cobbles and 45 percent angular pebbles; continuous distinct thick lime casts on undersides of rock fragments; many fine seams and soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—30 to 41 inches; very pale brown (10YR 7/3) extremely gravelly loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; 20 percent angular cobbles and 55 percent angular pebbles; continuous faint lime casts with cemented sand and fine pebbles on undersides of rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk3—41 to 60 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; 15 percent angular cobbles and 60 percent angular pebbles; continuous faint lime casts on undersides of rock fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 10 inches
Depth to lime: 15 to 25 inches

A horizons
- Value: 5 dry; 3 moist
- Chroma: 2 or 3
- Clay content: 15 to 25 percent
- Content of rock fragments: 15 to 35 percent—0 to 10 percent stones; 0 to 5 percent angular cobbles; 15 to 20 percent angular pebbles
- Reaction: pH 6.1 to 7.3

Bt1 horizon
- Value: 5 or 6 dry; 4 moist
- Chroma: 3 or 4
- Clay content: 30 to 35 percent
- Content of rock fragments: 35 to 60 percent—0 to 5 percent stones; 0 to 5 percent angular cobbles; 35 to 50 percent angular pebbles
- Reaction: pH 6.1 to 7.3

Bt2 horizon
- Value: 5 or 6 dry; 4 moist
- Chroma: 3 or 4
- Clay content: 15 to 25 percent
- Content of rock fragments: 50 to 70 percent—0 to 5 percent angular cobbles; 50 to 65 percent angular pebbles
- Reaction: pH 6.6 to 7.8

Bk1 and Bk2 horizons
- Value: 6 or 7 dry; 4 to 6 moist
- Chroma: 2 to 4
- Clay content: 10 to 25 percent
- Content of rock fragments: 50 to 80 percent—5 to 20 percent angular cobbles; 45 to 60 percent angular pebbles
- Calcium carbonate equivalent: 15 to 25 percent
- Reaction: pH 7.9 to 8.4

Bk3 horizon
- Hue: 10YR or 2.5Y
- Value: 6 or 7 dry; 4 or 5 moist
- Chroma: 2 to 4
- Texture: Sandy loam or loam
- Clay content: 5 to 15 percent

Content of rock fragments: 50 to 80 percent—5 to 20 percent angular cobbles; 45 to 60 percent angular pebbles
Calcium carbonate equivalent: 15 to 25 percent
Reaction: pH 7.4 to 8.4

34B—Sieben gravelly loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 4,000 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Sieben and similar soils: 95 percent

Minor Components
Soils with less rock fragments: 0 to 3 percent
Soils with less lime: 0 to 2 percent

Major Component Description

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 4.3 inches

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

Management

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

243C—Sieben stony loam, 2 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 15 percent
Elevation: 4,000 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Sieben and similar soils: 95 percent

Minor Components
Soils without stones: 0 to 3 percent
Soils with sand and gravel at 2 feet: 0 to 2 percent

Major Component Description

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

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

Management

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

Silvercity Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 24 inches and rapid below
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 4,500 to 4,800 feet
Mean annual precipitation: 20 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Loamy-skeletal over sandy or sandy-skeletal, mixed, superactive, frigid Typic Argiustolls

Typical Pedon

Silvercity gravelly loam, 1 to 4 percent slopes, in an area of rangeland, 1,500 feet north and 1,980 feet west of the southeast corner of sec. 21, T. 14 N., R. 9 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate very thin platy parting to moderate fine granular structure; soft, very friable, slightly sticky,

slightly plastic; many very fine roots; 15 percent pebbles; neutral; clear smooth boundary.
Bt1—6 to 10 inches; brown (10YR 5/3) gravelly clay loam, dark brown (10 YR 3/3) moist; moderate medium prismatic parting to moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; common faint clay films on faces of peds; 5 percent cobbles and 20 percent pebbles; neutral; clear smooth boundary.
Bt2—10 to 24 inches; brown (10YR 5/3) very gravelly clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; hard, firm, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; many faint clay films on faces of peds and on coarse rock fragments; 15 percent cobbles and 35 percent pebbles; slightly alkaline; clear smooth boundary.
2Bk—24 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly loamy sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky, nonplastic; few very fine roots in upper part; 25 percent cobbles and 40 percent pebbles; common distinct lime casts on undersides of larger coarse rock fragments; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 40 to 45 degrees F
Thickness of the mollic epipedon: 7 to 15 inches
Depth to the sandy skeletal material: 20 to 40 inches

A horizon
Value: 2 or 3 moist
Chroma: 1 or 2
Clay content: 15 to 25 percent
Content of rock fragments: 15 to 35 percent—0 to 5 percent cobbles; 15 to 30 percent pebbles
Reaction: pH 6.6 to 7.3

Bt1 horizon
Value: 4 or 5 dry; 3 or 4 moist
Chroma: 2 or 3
Texture: Loam or clay loam
Clay content: 25 to 35 percent
Content of rock fragments: 25 to 60 percent—5 to 10 percent cobbles; 20 to 50 percent pebbles
Reaction: pH 6.6 to 7.3

Bt2 horizon
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 3 or 4
Texture: Loam or clay loam
Clay content: 25 to 35 percent
Content of rock fragments: 35 to 60 percent—5 to 10 percent cobbles; 30 to 50 percent pebbles
Reaction: pH 6.6 to 7.8

2Bk horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 6 moist
Chroma: 2 or 3
Texture: Loamy sand or sand
Clay content: 0 to 5 percent
Content of rock fragments: 60 to 80 percent—10 to 20 percent cobbles; 50 to 60 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

4B—Silvercity gravelly loam, 1 to 4 percent slopes

Setting

Landform: Stream terraces
Slope: 1 to 4 percent
Elevation: 4,500 to 4,800 feet
Mean annual precipitation: 20 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Silvercity and similar soils: 95 percent

Minor Components
Soils with loamy sand at deeper depths: 0 to 3 percent
Soils with loamy sand at shallower depths: 0 to 2 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.6 inches

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

Management

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

254A—Silvercity-Wabek gravelly loams, 0 to 3 percent slopes

Setting

Landform:
- Silvercity—Stream terraces
- Wabek—Stream terraces

Slope:
- Silvercity—0 to 3 percent
- Wabek—0 to 3 percent

Elevation: 4,500 to 4,800 feet
Mean annual precipitation: 20 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Silvercity and similar soils: 75 percent
Wabek and similar soils: 20 percent

Minor Components
Soils that have slopes more than 3 percent: 0 to 2 percent
Soils with cobbly loam surface layers: 0 to 2 percent
Soils with very gravelly loam at 2 feet: 0 to 1 percent

Major Component Description

Silvercity
Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.6 inches

Wabek
Surface layer texture: Gravelly 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 2.1 inches

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

Management

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

Silverking Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderate to a depth of 24 inches and rapid below
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 3 percent
Elevation range: 4,400 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Aquic Ustochrepts

Typical Pedon

Silverking silt loam, 0 to 3 percent slopes, in an area of forestland, 1,200 feet north and 100 feet west of the southeast corner of sec. 18, T. 14 N., R. 8 W.

Oi—1 inch to 0; forest litter of slightly decomposed needles, twigs, and roots.
A—0 to 4 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; many light gray silt and sand skeletans on faces of peds; common worm casts; strongly effervescent; moderately alkaline; clear smooth boundary.
Bw—4 to 24 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; common fine and medium distinct strong brown (7.5YR 4/6) moist redox concentrations; weak medium prismatic structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; common worm casts and krotovinas in upper part; strongly effervescent; moderately alkaline; gradual smooth boundary.
2C—24 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky, nonplastic; 20 percent cobbles and 45 percent pebbles; slightly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 45 degrees F
Depth to the 2C horizon: 20 to 40 inches
Depth to the seasonal high water table: 24 to 42 inches

A horizon
Value: 3 or 4 moist; 5 or 6 dry
Clay content: 18 to 25 percent
Calcium carbonate equivalent: 1 to 5 percent
Reaction: pH 7.4 to 8.4

Bw horizon
Hue: 10YR or 7.5YR
Value: 4 or 5 moist (mottles), 6 or 7 dry; 4 or 5 moist, 5 or 6 dry
Chroma: 3 or 4 (mottles); 3, 4, or 6
Texture: Loam or silt loam
Clay content: 18 to 25 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

2C horizon
Clay content: 0 to 5 percent
Content of rock fragments: 60 to 75 percent—0 to 10 percent cobbles; 60 to 65 percent pebbles
Reaction: pH 7.4 to 8.4

7A—Silverking silt loam, 0 to 3 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 3 percent
Elevation: 4,400 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Silverking and similar soils: 85 percent

Minor Components
Well drained soils: 0 to 4 percent
Poorly drained soils: 0 to 4 percent
Very deep loamy soils: 0 to 4 percent
Soils with gravelly loam surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: Occasional
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Available water capacity: Mainly 5.0 inches

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

Management

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

Sinnigam Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Hills
Parent material: Material derived from hard shale and sandstone
Slope range: 8 to 45 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Clayey-skeletal, mixed, superactive, frigid Lithic Argiustolls

Typical Pedon

Sinnigam channery loam, in an area of Sinnigam-Regent complex, 15 to 45 percent slopes, in an area of rangeland, 2,600 feet north and 1,700 feet east of the southwest corner of sec. 12, T. 15 N., R. 4 W.

A—0 to 4 inches; grayish brown (10YR 5/2) channery loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy parting to moderate very fine granular structure; soft, very friable, moderately sticky, slightly plastic; many very fine roots; 30 percent channers; slightly acid; clear smooth boundary.

Bt1—4 to 8 inches; grayish brown (10YR 5/2) very channery clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds and on coarse rock fragments; 50 channers; neutral; gradual smooth boundary.

Bt2—8 to 17 inches; grayish brown (10YR 5/2) extremely channery silty clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct very dark grayish brown (10YR 3/2) moist clay films on faces of

peds and on coarse rock fragments; 65 percent channers; neutral; gradual smooth boundary.
R—17 inches; hard fractured interbedded sandstone and shale; few very fine roots in cracks; few faint lime coats on undersides of some rock fragments.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 12 inches; includes all or part of the argillic horizon
Depth to bedrock: 10 to 20 inches

A horizon
Hue: 7.5YR or 10YR
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 20 to 27 percent
Content of rock fragments: 15 to 35 percent channers
Reaction: pH 6.1 to 7.8

Bt1 horizon
Hue: 10YR, 7.5YR, or 5YR
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Texture: Clay loam, clay, or silty clay
Clay content: 35 to 50 percent
Content of rock fragments: 35 to 70 percent—15 to 35 percent stones and cobbles; 20 to 70 percent pebbles or channers
Reaction: pH 6.1 to 7.8

Bt2 horizon
Hue: 10YR, 7.5YR, or 5YR
Value: 4 or 5 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Clay loam, clay, or silty clay
Clay content: 35 to 50 percent
Content of rock fragments: 35 to 70 percent—15 to 30 percent stones and cobbles; 20 to 70 percent pebbles or channers
Reaction: pH 6.1 to 7.8

779E—Sinnigam-Regent complex, 15 to 45 percent slopes

Setting

Landform:
- Sinnigam—Hills
- Regent—Hills

Position on landform:
- Sinnigam—Backslopes and shoulders
- Regent—Backslopes and footslopes

Slope:
- Sinnigam—15 to 45 percent
- Regent—15 to 35 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Sinnigam and similar soils: 70 percent
Regent and similar soils: 20 percent

Minor Components
Work and similar soils: 0 to 3 percent
Castner and similar soils: 0 to 3 percent
Soils that have slopes more than 45 percent: 0 to 2 percent
Very shallow soils: 0 to 2 percent

Major Component Description

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

Regent
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

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

Management

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

Slategoat Series

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Moderate
Landform: Stream terraces

Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Typic Haplustepts

Typical Pedon

Slategoat silt loam, 0 to 2 percent slopes, in an area of forestland, 2,100 feet south and 100 feet west of the northeast corner of sec. 24, T. 14 N., R. 9 W.

Oi—1 inch to 0; forest litter of slightly decomposed needles, twigs, and leaves.
A—0 to 7 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few medium roots; common light gray silt and sand skeletans on faces of peds; neutral; clear smooth boundary.
AB—7 to 12 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and few medium roots; many very fine tubular and interstitial pores; common light gray silt and sand skeletans on faces of peds; slightly alkaline; gradual smooth boundary.
Bw—12 to 21 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic parting to moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial and few medium tubular pores; slightly alkaline; gradual smooth boundary.
Bk1—21 to 38 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak medium prismatic parting to weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial and few medium tubular pores; common fine irregular seams of lime; disseminated lime; strongly effervescent; slightly alkaline; gradual smooth boundary.
Bk2—38 to 60 inches; light gray (10YR 7/2) silt loam, grayish brown (10YR 5/2) moist; common fine prominent yellowish brown (10YR 5/6) moist redox concentrations; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and medium roots; many very fine tubular and interstitial pores; common fine irregular seams of lime; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 45 degrees F
Depth to the Bk horizon: 15 to 30 inches
Depth to the seasonal high water table: 60 to 72 inches from May through July

A horizon
Hue: 10YR or 7.5YR
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 1 or 2
Clay content: 18 to 25 percent
Reaction: pH 6.1 to 7.3

AB horizon
Hue: 10YR or 7.5YR
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 18 to 25 percent
Reaction: pH 6.1 to 7.8

Bw horizon
Hue: 10YR or 7.5YR
Value: 5 or 6 dry
Chroma: 3 or 4
Texture: Loam or silt loam
Clay content: 18 to 25 percent
Reaction: pH 6.6 to 7.8

Bk horizons
Hue: 10YR or 7.5YR
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam or silt loam
Clay content: 18 to 25 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 8.4

609A—Slategoat silt loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Slategoat and similar soils: 90 percent

Minor Components
Stady, cool soils: 0 to 4 percent
Poorly drained soils: 0 to 1 percent
Soils with sand and gravel at 30 inches: 0 to 3 percent
Soils with gravelly loam surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 60 to 72 inches
Available water capacity: Mainly 10.3 inches

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

Management

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

Soapcreek Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Flood plains and low stream terraces
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 4,000 to 5,000 feet
Mean annual precipitation: 12 to 19 inches
Frost-free period: 90 to 120 days

Taxonomic Class: Fine, mixed, superactive, frigid Fluvaquentic Haplustolls

Typical Pedon

Soapcreek silty clay, 0 to 2 percent slopes, in an area of irrigated hayland, 500 feet south and 700 feet west of the northeast corner of sec. 18, T. 11 N., R. 4 W.

Ap—0 to 5 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; strong very fine granular structure; hard, firm, moderately sticky, moderately plastic; many very fine roots; many fine tubular and interstitial pores; moderately alkaline; clear smooth boundary.

A—5 to 12 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; strong very fine and fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; many very fine roots; many very fine tubular and interstitial pores; slightly effervescent; moderately alkaline; clear smooth boundary.

Bk—12 to 20 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; moderate very fine and fine granular structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bkg—20 to 30 inches; gray (10YR 5/1) silty clay, dark gray (10YR 4/1) moist; common medium prominent light brown (7.5YR 6/4) redox concentrations, dark brown (7.5YR 4/4) moist; weak very fine and fine granular structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; common fine soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bg1—30 to 40 inches; gray (5Y 6/1) silty clay, dark gray (5Y 4/1) moist; common medium prominent light yellowish brown (2.5Y 6/4) redox concentrations, light olive brown (2.5Y 5/4) moist; massive; hard, firm, moderately sticky, moderately plastic; few very fine roots; common very fine tubular and interstitial pores; slightly alkaline; gradual smooth boundary.

Bg2—40 to 60 inches; gray (5Y 6/1) silty clay, gray (5Y 4/1) moist; common medium faint light olive gray (5Y 6/2) redox depletions; massive; hard, firm, moderately sticky, moderately plastic; few very fine roots; 5 percent pebbles and pieces of charcoal; slightly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 10 to 15 inches
Depth to the seasonal high water table: 24 to 42 inches

A horizons
Value: 2 or 3 moist; 4 or 5 dry
Chroma: 1 or 2
Clay content: 40 to 50 percent
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 4 moist; 5 or 6 dry
Chroma: 1 or 2
Texture: Silty clay or silty clay loam
Clay content: 35 to 50 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 8.4

Bkg horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 4 moist; 5 or 6 dry
Chroma: 1 or 2
Texture: Silty clay or silty clay loam
Clay content: 35 to 50 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 8.4

Bg1 horizon
Hue: 2.5Y or 5Y
Value: 4 or 5 moist; 6 dry
Chroma: 1 or 2
Texture: Silty clay or silty clay loam
Clay content: 35 to 50 percent
Reaction: pH 7.4 to 8.4

Bg2 horizon
Hue: 2.5Y or 5Y
Value: 4 or 5 moist; 6 dry
Chroma: 1 or 2
Texture: Mainly silty clay loam or silty clay but includes thin strata of fine sandy loam, loam, and silt loam
Clay content: 25 to 45 percent
Reaction: pH 7.4 to 8.4

508A—Soapcreek silty clay, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 12 to 19 inches
Frost-free period: 90 to 120 days

Composition

Major Components
Soapcreek and similar soils: 95 percent

Minor Components
Fairway and similar soils: 0 to 2 percent
Poorly drained soils: 0 to 2 percent
Soils with silty clay loam surfaces: 0 to 1 percent

Major 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: Rare
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Available water capacity: Mainly 9.9 inches

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

Management

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

Stady Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to a depth of 29 inches and rapid below
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Typic Haplustolls

Typical Pedon

Stady silt loam, in an area of Stady-Wabek complex, 1 to 4 percent slopes, in an area of rangeland, 1,400 feet south and 100 feet east of the northwest corner of sec. 21, T. 14 N., R. 8 W.

A1—0 to 3 inches; gray (10YR 5/1) silt loam, very dark gray (10YR 3/1) moist; moderate very thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; neutral; clear smooth boundary.

A2—3 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; weak medium prismatic parting to moderate medium platy; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very

fine tubular and interstitial pores; neutral; clear smooth boundary.

Bw—6 to 16 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; slightly alkaline; gradual wavy boundary.

Bk1—16 to 25 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium prismatic parting to weak coarse subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; few distinct lime coats on faces of peds; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—25 to 29 inches; light brownish gray (10YR 6/2) very gravelly loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; common very fine tubular and interstitial pores; 60 percent pebbles; continuous faint lime casts on undersides of rock fragments; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

2Bk3—29 to 60 inches; light yellowish brown (10YR 6/4) extremely gravelly sand, dark yellowish brown (10YR 4/4 moist); single grain; loose, nonsticky, nonplastic; few very fine roots in upper part; 65 percent pebbles; continuous faint lime casts on undersides of rock fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Depth to secondary lime: 11 to 27 inches

A horizons
Hue: 10YR or 2.5Y
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 1 to 3
Clay content: 18 to 25 percent
Reaction: pH 6.6 to 7.3

Bw horizon
Hue: 10YR or 2.5Y
Value: 4 to 6 dry; 2 to 4 moist
Chroma: 2 to 4
Clay content: 18 to 25 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 or 3
Clay content: 10 to 20 percent
Content of rock fragments: 0 to 15 percent pebbles
Calcium carbonate equivalent: 10 to 15 percent
Reaction: pH 7.4 to 8.4

Bk2 horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Content of rock fragments: 35 to 60 percent pebbles
Calcium carbonate equivalent: 10 to 15 percent
Reaction: pH 7.4 to 8.4

2Bk3 horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 to 4
Clay content: 0 to 5 percent
Content of rock fragments: 60 to 70 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

5B—Stady-Wabek complex, 1 to 4 percent slopes

Setting

Landform:
- Stady—Stream terraces
- Wabek—Stream terraces

Slope:
- Stady—1 to 4 percent
- Wabek—1 to 4 percent

Elevation: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Stady and similar soils: 70 percent
Wabek and similar soils: 25 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 2 percent
Very deep loam soils: 0 to 2 percent
Soils with gravelly silt loam surfaces: 0 to 1 percent

Major Component Description

Stady
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 4.4 inches

Wabek
Surface layer texture: Gravelly 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 2.3 inches

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

Management

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

13B—Stady silt loam, cool, 1 to 4 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 4 percent
Elevation: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Stady and similar soils: 95 percent

Minor Components
Soils with gravelly loam surface layers: 0 to 2 percent
Very deep loam soils: 0 to 2 percent
Soils with sand and gravel at 15 inches: 0 to 1 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

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

Management

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

Starley Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Material derived from limestone
Slope range: 15 to 45 percent
Elevation range: 6,000 to 7,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Lithic Haplocryolls

Typical Pedon

Starley channery loam, in an area of Hanson-Starley channery loams, 15 to 45 percent slopes, in an area of rangeland, 1,000 feet south and 500 feet west of the northeast corner of sec. 10, T. 11 N., R. 6 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) channery loam, very dark brown (10YR 2/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 30 percent channers; moderately alkaline; clear smooth boundary.
A2—4 to 6 inches; dark grayish brown (10YR 4/2) very channery loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 50 percent channers; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk—6 to 18 inches; very pale brown (10YR 7/3) very channery loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 55 percent channers; disseminated lime; continuous prominent lime casts on undersides of rock fragments; violently effervescent; moderately alkaline.
R—18 inches; hard limestone bedrock with few cracks.

Range in Characteristics

Soil temperature: 35 to 45 degrees F
Depth to the lithic contact: 10 to 20 inches
Thickness of the mollic epipedon: 7 to 10 inches

A horizons
Hue: 7.5YR, 10YR, 2.5Y, or 5Y
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 15 to 27 percent
Content of rock fragments: 15 to 35 percent channers
Reaction: pH 6.6 to 8.4

Bk horizon
Hue: 7.5YR, 10YR, 2.5Y, or 5Y
Value: 5 to 8 dry; 4 to 7 moist
Chroma: 2 to 4
Texture: Loam, silt loam, or clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 35 to 70 percent channers
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 9.0

Stemple Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium and material derived from igneous and argillite rock
Slope range: 8 to 60 percent
Elevation range: 5,000 to 7,800 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Typic Palecryalfs

Typical Pedon

Stemple very channery loam, in an area of Stemple-Tigeron very channery loams, 30 to 60 percent slopes, in an area of forestland, 2,500 feet north and 1,300 feet east of the southwest corner of sec. 30, T. 14 N., R. 5 W.

Oi—2 inches to 0; forest litter of partially decomposed needles, twigs, roots, and forbs; abrupt smooth boundary.
E1—0 to 10 inches; light gray (10YR 7/2) very channery loam, light brownish gray (10YR 6/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and few medium roots; 10 percent flagstones and 40 percent channers; strongly acid; clear smooth boundary.
E2—10 to 28 inches; white (2.5Y 8/2) extremely channery loam, light yellowish brown (2.5Y 6/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; 10 percent flagstones and 55 percent channers; strongly acid; gradual smooth boundary.
E/Bt—28 to 32 inches; 80 percent white (2.5Y 8/2) extremely channery loam, light yellowish brown (2.5Y 6/4) moist (E part); 20 percent light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist (B part); moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; many silt and sand skeletans on faces of peds; 70 percent channers; moderately acid; gradual smooth boundary.
Bt—32 to 70 inches; pale yellow (2.5Y 7/4) extremely channery clay loam, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; few fine and medium roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; many faint silt and sand skeletans on faces of peds in upper 2 inches of horizon; 10 percent flagstones and 55 percent channers; moderately acid.

Range in Characteristics

Soil temperature: 37 to 42 degrees F
Depth to the argillic horizon: 25 to 50 inches

E1 horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 6 or 7 dry; 5 or 6 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Content of rock fragments: 35 to 60 percent—10 to 15 percent flagstones; 25 to 45 percent channers
Reaction: pH 5.1 to 6.5

E2 horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 6 to 8 dry; 4 to 6 moist
Chroma: 2 to 4
Clay content: 10 to 20 percent
Content of rock fragments: 35 to 80 percent—0 to 20 percent flagstones; 35 to 60 percent channers
Reaction: pH 5.1 to 6.5

E/Bt horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: E part—6 to 8 dry; 4 to 6 moist; B part—5 or 6 dry; 4 or 5 moist
Chroma: E part—2 to 4; B part—4 or 6
Clay content: 15 to 27 percent
Content of rock fragments: 35 to 80 percent—0 to 10 percent flagstones; 35 to 70 percent channers
Reaction: pH 5.1 to 6.5

Bt horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 4 or 6
Clay content: 27 to 35 percent
Content of rock fragments: 60 to 80 percent—10 to 20 percent flagstones; 50 to 60 percent channers
Reaction: pH 5.6 to 6.5

290F—Stemple-Tigeron very channery loams, 30 to 60 percent slopes

Setting

Landform:
- Stemple—Mountains
- Tigeron—Mountains

Slope:
- Stemple—30 to 60 percent
- Tigeron—30 to 60 percent

Elevation: 5,500 to 7,800 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Stemple and similar soils: 70 percent
Tigeron and similar soils: 20 percent

Minor Components
Moderately deep soils: 0 to 4 percent
Soils that have slopes more than 60 percent: 0 to 3 percent
Soils that are calcareous throughout: 0 to 3 percent

Major Component Description

Stemple
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

Tigeron
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
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.

Management

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

690F—Stemple-Tigeron-Cowood very channery loams, dry, 30 to 60 percent slopes

Setting

Landform:
- Stemple—Mountains
- Tigeron—Mountains
- Cowood—Mountains

Position on landform:
- Stemple—Backslopes and footslopes
- Tigeron—Backslopes and footslopes
- Cowood—Backslopes and shoulders

Slope:
- Stemple—30 to 60 percent
- Tigeron—30 to 60 percent
- Cowood—30 to 60 percent

Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Stemple and similar soils: 40 percent
Tigeron and similar soils: 35 percent
Cowood and similar soils: 15 percent

Minor Components
Cheadle and similar soils: 0 to 3 percent
Very shallow soils: 0 to 3 percent
Areas of rock outcrop: 0 to 2 percent
Deep soils: 0 to 2 percent

Major Component Description

Stemple
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

Tigeron
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.3 inches

Cowood
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.0 inches

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

Management

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

790E—Stemple-Tigeron very channery loams, cool, 8 to 30 percent slopes

Setting

Landform:
- Stemple—Mountains
- Tigeron—Mountains

Slope:
- Stemple—8 to 30 percent
- Tigeron—8 to 30 percent

Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Stemple and similar soils: 70 percent
Tigeron and similar soils: 20 percent

Minor Components
Soils that have slopes more than 30 percent: 0 to 5 percent
Moderately deep soils: 0 to 5 percent

Major Component Description

Stemple
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

Tigeron
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
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.

Management

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

790F—Stemple-Tigeron very channery loams, cool, 30 to 60 percent slopes

Setting

Landform:
- Stemple—Mountains
- Tigeron—Mountains

Slope:
- Stemple—30 to 60 percent
- Tigeron—30 to 60 percent

Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Stemple and similar soils: 70 percent
Tigeron and similar soils: 20 percent

Minor Components
Soils that have slopes more than 60 percent: 0 to 5 percent
Moderately deep soils: 0 to 5 percent

Major Component Description

Stemple
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

Tigeron
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
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.

Management

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

Stryker Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Fine-silty, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Stryker silt loam, cool, 0 to 2 percent slopes, in an area of forestland, 2,200 feet north and 2,600 feet west of the southeast corner of sec. 23, T. 14 N., R. 9 W.

Oi—2 inches to 0; forest litter of slightly decomposed needles and twigs.

E—0 to 3 inches; pinkish gray (7.5YR 7/2) silt loam, brown (7.5YR 5/2) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine roots; many very fine tubular and interstitial pores; slightly acid; clear smooth boundary.

E/Bt—3 to 7 inches; 60 percent pinkish gray (7.5YR 7/2) silt loam, brown (7.5YR 5/2) moist (E part); 40 percent pinkish gray (7.5YR 7/2) silt loam, brown (7.5YR 5/4) moist (B part); moderate medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; few faint dark brown (7.5YR 5/4) moist clay films on faces of peds; many light gray silt skeletans on faces of peds; slightly acid; clear smooth boundary.

Bt1—7 to 19 inches; pinkish gray (7.5YR 7/2) silty clay loam, brown (7.5YR 5/4) moist; moderate medium prismatic parting to moderate medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; common light gray silt skeletans on faces of peds; neutral; clear smooth boundary.

Bt2—19 to 27 inches; pinkish gray (7.5YR 7/2) silt loam, brown (7.5YR 5/4) moist; weak medium

prismatic parting to moderate medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; neutral; gradual wavy boundary.

Bt3—27 to 40 inches; pinkish gray (7.5YR 7/2) silt loam, brown (7.5YR 5/2) moist; few fine distinct strong brown (7.5YR 5/6) moist redox concentrations; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine tubular and interstitial pores; neutral; gradual wavy boundary.

Bk—40 to 48 inches; pinkish gray (7.5YR 7/2) silt loam, brown (7.5YR 5/2) moist; common fine distinct strong brown (7.5YR 5/6) moist redox concentrations; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; many very fine tubular and interstitial pores; disseminated lime; common fine seams and soft masses of lime; strongly effervescent; neutral; clear smooth boundary.

2C—48 to 60 inches; light brownish gray (10YR 6/2) very gravelly sand, dark grayish brown (10YR 4/2) moist; single grain; loose, nonsticky, nonplastic; 50 percent pebbles.

Range in Characteristics

Soil temperature: 41 to 44 degrees F
Depth to the Bk horizon: 20 to 40 inches
Depth to the seasonal high water table: 24 to 42 inches

E horizon
Hue: 7.5YR or 10YR
Value: 5 to 7 dry; 3 to 5 moist
Chroma: 1 to 3
Clay content: 18 to 27 percent
Reaction: pH 5.6 to 6.5

E/Bt horizon
Hue: E part—10YR or 7.5YR; B part—10YR or 7.5YR
Value: E part—6 or 7 dry; 5 or 6 moist; B part—6 or 7 dry; 4 to 6 moist
Chroma: E part—2 or 3; B part—2 to 4 moist
Clay content: 18 to 27 percent
Reaction: pH 6.1 to 7.3

Bt horizons
Hue: 10YR or 7.5YR
Value: 6 or 7 dry; 5 or 6 moist
Chroma: 2 to 4
Texture: Silty clay loam or silt loam
Clay content: 25 to 35 percent
Reaction: pH 6.6 to 7.8

Bk horizon
Hue: 10YR or 7.5YR
Value: 6 to 8 dry; 5 or 6 moist
Chroma: 2 to 4
Texture: Silt loam or silty clay loam
Clay content: 18 to 30 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

2C horizon
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Sand or loamy sand
Clay content: 0 to 10 percent
Content of rock fragments: 35 to 60 percent—0 to 10 percent stones and cobbles; 35 to 50 percent pebbles
Reaction: pH 7.4 to 8.4

8A—Stryker silt loam, cool, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Stryker and similar soils: 90 percent

Minor Components
Well drained soils: 0 to 7 percent
Soils with sand and gravel at 30 inches: 0 to 2 percent
Poorly drained soils: 0 to 1 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Depth to the seasonal high water table: Apparent, 24 to 42 inches
Available water capacity: Mainly 9.4 inches

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

Management

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

Swiftcurrent Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Loamy colluvium and alluvium
Slope range: 8 to 65 percent
Elevation range: 4,800 to 6,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Fine-loamy, mixed, superactive Eutric Glossocryalfs

Typical Pedon

Swiftcurrent loam, 8 to 35 percent slopes, in an area of forestland, 1,200 feet south and 2,500 feet west of the northeast corner of sec. 30, T. 19 N., R. 8 W.

Oi—2 inches to 0; forest litter of pine needles and twigs.

E—0 to 4 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; moderate thin platy parting to moderate very fine and fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine and fine and few medium roots; 5 percent pebbles; neutral; clear smooth boundary.

E/Bt—4 to 11 inches; 80 percent very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist (E part); 20 percent pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist (B part); moderate medium prismatic parting to moderate fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; many very fine and fine and few medium roots; many very fine tubular and interstitial pores; many silt and sand skeletans on faces of peds; few faint clay films on faces of peds; 5 percent cobbles and 5 percent pebbles; neutral; gradual smooth boundary.

Bt1—11 to 28 inches; pale brown (10YR 6/3) gravelly clay loam, dark yellowish brown (10YR 4/3) moist; moderate medium prismatic parting to moderate medium and coarse subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 5 percent cobbles and 15 percent pebbles; neutral; gradual smooth boundary.

Bt2—28 to 41 inches; light yellowish brown (10YR 6/4) gravelly clay loam, yellowish brown (10YR 5/4) moist; moderate medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 5 percent cobbles and 15 percent pebbles; slightly alkaline; gradual smooth boundary.

Bk—41 to 60 inches; very pale brown (10YR 7/3) gravelly loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; few very fine roots; common very fine interstitial pores; 10 percent cobbles and 20 percent pebbles; disseminated lime; continuous faint lime casts on undersides of rock fragments; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 37 to 42 degrees F
Depth to the top of the argillic horizon: 8 to 24 inches
Depth to carbonates: 40 to 60 inches

E horizon
- Hue: 5YR, 7.5YR, or 10YR
- Value: 5 to 7 dry; 4 or 5 moist
- Chroma: 2 or 3
- Clay content: 15 to 25 percent
- Content of rock fragments: 0 to 15 percent pebbles
- Reaction: pH 6.1 to 7.3

E/Bt horizon
- Hue: 5YR, 7.5YR, or 10YR
- Value: E part—5 to 7 dry; 4 or 5 moist; B part—4 to 6 dry; 3 to 5 moist
- Chroma: E part—2 or 3; B part—3 or 4
- Texture: Loam, sandy loam, or sandy clay loam
- Clay content: 18 to 35 percent (mixed)
- Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
- Reaction: pH 6.1 to 7.3

Bt horizons
- Hue: 5YR, 7.5YR, or 10YR
- Value: 5 or 6 dry; 3 to 5 moist
- Chroma: 2 to 4
- Texture: Clay loam or sandy clay loam
- Clay content: 27 to 35 percent

Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles
Reaction: pH 6.6 to 7.8

Bk horizon
Hue: 7.5YR or 10YR
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Loam or sandy clay loam
Clay content: 20 to 27 percent
Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

96E—Swiftcurrent loam, 8 to 35 percent slopes

Setting

Landform: Mountains
Slope: 8 to 35 percent
Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Swiftcurrent and similar soils: 90 percent

Minor Components
Tigeron and similar soils: 0 to 3 percent
Mikesell and similar soils: 0 to 3 percent
Soils that have slopes more than 35 percent: 0 to 2 percent
Soils with stony surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forestland
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.

Management

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

96F—Swiftcurrent loam, 35 to 65 percent slopes

Setting

Landform: Mountains
Slope: 35 to 65 percent
Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Swiftcurrent and similar soils: 90 percent

Minor Components
Tigeron and similar soils: 0 to 4 percent
Moderately deep soils: 0 to 3 percent
Soils with stony surface layers: 0 to 3 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium or colluvium
Native plant cover type: Forestland
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.

Management

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

Thess Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate to 25 inches and rapid below
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Aridic Calciustepts

Typical Pedon

Thess loam, 0 to 2 percent slopes, in an area of rangeland, 300 feet north and 2,400 feet west of the southeast corner of sec. 17, T. 10 N., R. 3 W.

A—0 to 4 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; weak medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; few faint lime casts on sides and undersides of pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk1—4 to 20 inches; very pale brown (10YR 7/3) loam, brown (10YR 5/3) moist; weak medium prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; continuous faint lime casts on sides and undersides of pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—20 to 25 inches; light gray (10YR 7/2) gravelly sandy loam, pale brown (10YR 6/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 35 percent pebbles; continuous faint lime casts on sides and undersides of pebbles; common medium soft masses of lime between pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

2Bk3—25 to 32 inches; light brownish gray (2.5Y 6/2) extremely gravelly sand, dark grayish brown (2.5Y 4/2) moist; single grain; nonsticky nonplastic; common very fine roots bunched in upper part; 65 percent pebbles; continuous faint lime casts on undersides of pebbles; common medium soft masses of lime between pebbles; disseminated lime; violently effervescent; moderately alkaline; gradual smooth boundary.

2Bk4—32 to 60 inches; light brownish gray (2.5Y 6/2) extremely gravelly sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky, nonplastic; 10 percent cobbles and 60 percent pebbles; continuous faint lime casts on undersides of cobbles and pebbles; disseminated lime; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the calcic horizon: 3 to 5 inches
Depth to the 2Bk horizon: 20 to 35 inches

A horizon
- Hue: 10YR or 2.5Y
- Value: 5 or 6 dry; 4 or 5 moist
- Chroma: 2 or 3
- Clay content: 18 to 25 percent
- Content of rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles; 0 to 10 percent pebbles
- Calcium carbonate equivalent: 5 to 10 percent
- Reaction: pH 7.4 to 8.4

Bk1 horizon
- Hue: 10YR or 2.5Y
- Value: 6 to 8 dry; 5 to 7 moist
- Chroma: 2 or 3
- Texture: Loam, silt loam, or sandy loam
- Clay content: 15 to 25 percent
- Content of rock fragments: 0 to 25 percent—0 to 5 percent stones and cobbles; 0 to 20 percent pebbles
- Calcium carbonate equivalent: 15 to 40 percent
- Reaction: pH 7.4 to 8.4

Bk2 horizon
- Hue: 10YR or 2.5Y
- Value: 6 to 8 dry; 5 to 7 moist
- Chroma: 2 or 3
- Texture: Loam, silt loam, or sandy loam
- Clay content: 15 to 25 percent
- Content of rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles; 0 to 10 percent pebbles
- Calcium carbonate equivalent: 15 to 40 percent
- Reaction: pH 7.4 to 8.4

2Bk horizons
- Hue: 10YR or 2.5Y (colors are variegated)
- Value: 6 to 8 dry; 4 to 7 moist
- Chroma: 2 or 3
- Texture: Sand or loamy sand
- Clay content: 0 to 5 percent
- Content of rock fragments: 35 to 85 percent—0 to 20 percent stones and cobbles; 35 to 65 percent pebbles
- Calcium carbonate equivalent: 15 to 25 percent
- Reaction: pH 7.4 to 8.4

209A—Thess loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Thess and similar soils: 90 percent

Minor Components
Scravo and similar soils: 0 to 5 percent
Soils with gravelly loam surface layers: 0 to 5 percent

Major Component Description

Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.4 inches

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

Management

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

309A—Thess-Scravo complex, 0 to 2 percent slopes

Setting

Landform:
- Thess—Stream terraces
- Scravo—Stream terraces

Slope:
- Thess—0 to 2 percent
- Scravo—0 to 2 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Thess and similar soils: 50 percent
Scravo and similar soils: 40 percent

Minor Components
Nippt and similar soils: 0 to 5 percent
Soils with cobbly loam surface layers: 0 to 5 percent

Major Component Description

Thess
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 5.4 inches

Scravo
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 2.6 inches

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

Management

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

Tigeron Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium derived from argillite and igneous rock
Slope range: 8 to 60 percent
Elevation range: 5,000 to 7,800 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Eutric Haplocryalfs

Typical Pedon

Tigeron very channery loam, in an area of Stemple-Tigeron-Cowood very channery loams, dry, 30 to 60 percent slopes, in an area of forestland, 1,700 feet north and 1,600 feet west of the southeast corner of sec. 11, T. 15 N., R. 7 W.

Oi—2 inches to 0; forest litter of undecomposed and decomposed needles, twigs, and cones.
E—0 to 11 inches; pinkish gray (7.5YR 7/2) very channery loam, dark brown (7.5YR 4/2) moist; moderate very thin platy parting to moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many very fine interstitial pores; 35 percent channers; moderately acid; gradual smooth boundary.

E and Bt—11 to 22 inches; 80 percent pinkish gray (7.5YR 7/2) extremely channery loam, dark brown (7.5YR 4/2) moist; moderate fine granular structure (E part); 20 percent light brown (7.5YR 6/4) extremely channery clay loam lamellae 1/4- to 1/2-inch thick, dark brown (7.5YR 4/2) moist (B part); slightly hard, very friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine pores; 60 percent channers; slightly acid; gradual smooth boundary.

Bt—22 to 60 inches; light brown (7.5YR 6/4) extremely channery clay loam, strong brown (7.5YR 5/6) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 70 percent channers; slightly acid.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the argillic horizon: 13 to 24 inches

E horizon
- Hue: 7.5YR or 10YR
- Value: 6 to 8 dry; 3 to 6 moist
- Chroma: 2 or 3
- Clay content: 10 to 20 percent
- Content of rock fragments: 35 to 60 percent—0 to 15 percent stones and flagstones; 35 to 45 percent channers
- Reaction: pH 5.1 to 6.5

E and Bt horizon
- Hue: E part—7.5YR or 10YR; B part—7.5YR or 10YR
- Value: E part—6 to 8 dry; 3 to 6 moist; B part—5 or 6 dry; 4 or 5 moist
- Chroma: E part—2 or 3; B part—2 to 4 or 6
- Texture: E part—sandy loam or loam; B part—sandy loam, loam, clay loam, or sandy clay loam
- Clay content: E part—10 to 22 percent; B part—10 to 35 percent
- Content of rock fragments: 25 to 70 percent—10 to 25 percent stones and flagstones; 15 to 45 percent channers
- Reaction: pH 5.1 to 6.5

Bt horizon
- Hue: 7.5YR or 10YR
- Value: 5 to 7 dry; 4 to 6 moist
- Chroma: 2 to 4 or 6
- Texture: Sandy loam, sandy clay loam, clay loam, or loam
- Clay content: 15 to 35 percent
- Content of rock fragments: 60 to 85 percent—20 to 30 percent stones and flagstones; 40 to 55 percent channers
- Reaction: pH 5.1 to 6.5

290E—Tigeron very cobbly loam, 15 to 35 percent slopes

Setting

Landform: Mountains
Slope: 15 to 35 percent
Elevation: 5,500 to 7,000 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Tigeron and similar soils: 90 percent

Minor Components
Areas of rubble land: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 2 percent
Moderately deep and deep soils: 0 to 2 percent
Soils with stony surface layers: 0 to 2 percent
Soils that are calcareous throughout: 0 to 2 percent

Major Component Description

Surface layer texture: Very cobbly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
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.

Management

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

890F—Tigeron very gravelly loam, cool, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 20 to 28 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Tigeron and similar soils: 90 percent

Minor Components
Soils that have slopes less than 35 percent: 0 to 5 percent
Moderately deep soils: 0 to 5 percent

Major Component Description

Surface layer texture: Very gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
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.

Management

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

Tolex Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Material derived from argillite and igneous bedrock
Slope range: 8 to 80 percent
Elevation range: 3,500 to 6,000 feet
Mean annual precipitation: 12 to 25 inches
Frost-free period: 70 to 120 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lithic Haplustalfs

Typical Pedon

Tolex channery loam, 8 to 35 percent slopes, in an area of forestland, 2,100 feet south and 200 feet east of the northwest corner of sec. 34, T. 12 N., R. 3 W.

Oi—1 inch to 0; forest litter of partially decomposed needles, twigs, and roots; clear smooth boundary.
A—0 to 1 inch; grayish brown (10YR 5/2) channery loam, very dark grayish brown (10YR 3/2) moist; moderate very thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, nonplastic; common very fine and fine roots; many very fine interstitial pores; 20 percent channers; moderately acid; clear smooth boundary.
E—1 to 5 inches; very pale brown (10YR 7/3) channery loam, yellowish brown (10YR 5/4) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine interstitial pores; 20 percent channers; moderately acid; clear smooth boundary.
Bt—5 to 13 inches; light yellowish brown (10YR 6/4) extremely channery clay loam, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds and on coarse rock fragments; 65 percent channers; slightly acid; gradual smooth boundary.
BC—13 to 18 inches; brownish yellow (10YR 6/6) extremely channery loam, yellowish brown (10YR 5/6) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; 5 percent flagstones and 85 percent channers; slightly effervescent on undersides of coarse rock fragments; neutral.
R—18 inches; hard argillite bedrock with few cracks; few fine roots in some cracks.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to bedrock: 10 to 20 inches

A horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 5 or 6 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 15 to 25 percent

Content of rock fragments: 15 to 60 percent—0 to 20 percent stones and flagstones; 15 to 40 percent channers
Reaction: pH 5.6 to 6.5

E horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loam or sandy loam
Clay content: 15 to 25 percent
Content of rock fragments: 15 to 75 percent—0 to 15 percent flagstones; 15 to 60 percent channers
Reaction: pH 5.6 to 6.5

Bt horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 3, 4, or 6
Texture: Clay loam or sandy clay loam
Clay content: 27 to 35 percent
Content of rock fragments: 60 to 80 percent—0 to 10 percent flagstones; 60 to 70 percent channers
Reaction: pH 5.6 to 6.5

BC horizon
Hue: 5YR, 7.5YR, or 10YR
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 3, 4, or 6
Clay content: 10 to 25 percent
Content of rock fragments: 60 to 90 percent—0 to 10 percent flagstones; 55 to 85 percent channers
Reaction: pH 6.6 to 7.8

25F—Tolex-Mocmont-Rock outcrop complex, cool, 25 to 60 percent slopes

Setting

Landform:
- Tolex—Mountains
- Mocmont—Mountains

Position on landform:
- Tolex—Backslopes and shoulders
- Mocmont—Footslopes
- Rock outcrop—Shoulders

Slope:
- Tolex—25 to 60 percent
- Mocmont—25 to 60 percent

Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Tolex and similar soils: 45 percent
Mocmont and similar soils: 35 percent
Rock outcrop: 15 percent

Minor Components
Castner and similar soils: 0 to 2 percent
Holter and similar soils: 0 to 2 percent
Soils with stony surface layers: 0 to 1 percent

Major Component Description

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.3 inches

Mocmont
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

Rock outcrop
Definition: Hard argillite bedrock

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

Management

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

563E—Tolex-Tolman-Hauz channery loams, 8 to 45 percent slopes

Setting

Landform:
- Tolex—Mountains
- Tolman—Mountains
- Hauz—Mountains

Position on landform:
- Tolex—Backslopes and shoulders
- Tolman—Backslopes and shoulders
- Hauz—Backslopes

Slope:
- Tolex—8 to 45 percent
- Tolman—8 to 45 percent
- Hauz—8 to 45 percent

Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Tolex and similar soils: 40 percent
Tolman and similar soils: 35 percent
Hauz and similar soils: 20 percent

Minor Components
Sieben and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Soils that have slopes more than 45 percent: 0 to 1 percent

Major Component Description

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.3 inches

Tolman
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

Hauz
Surface layer texture: Channery loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
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.

Management

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

663E—Tolex channery loam, 8 to 35 percent slopes

Setting

Landform: Mountains
Slope: 8 to 35 percent
Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 90 to 120 days

Composition

Major Components
Tolex and similar soils: 90 percent

Minor Components
Tolman and similar soils: 0 to 2 percent
Whitecow and similar soils: 0 to 2 percent
Mocmont and similar soils: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 2 percent
Very shallow soils: 0 to 2 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

763E—Tolex-Holter-Castner channery loams, 8 to 45 percent slopes

Setting

Landform:
- Tolex—Mountains
- Holter—Mountains
- Castner—Mountains

Position on landform:
- Tolex—Backslopes and shoulders
- Holter—Footslopes
- Castner—Backslopes and shoulders

Slope:
- Tolex—8 to 45 percent
- Holter—8 to 45 percent
- Castner—8 to 45 percent

Elevation: 4,500 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Tolex and similar soils: 40 percent
Holter and similar soils: 30 percent
Castner and similar soils: 20 percent

Minor Components
Areas of rock outcrop: 0 to 4 percent
Soils that have slopes more than 45 percent: 0 to 3 percent
Deep loamy soils with trees: 0 to 3 percent

Major Component Description

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.3 inches

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

Castner
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
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.

Management

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

963F—Tolex-Mocmont-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform:
- Tolex—Mountains
- Mocmont—Mountains

Position on landform:
- Tolex—Backslopes and shoulders
- Mocmont—Footslopes
- Rock outcrop—Shoulders

Slope:
- Tolex—25 to 60 percent
- Mocmont—25 to 60 percent

Elevation: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Tolex and similar soils: 45 percent
Mocmont and similar soils: 35 percent
Rock outcrop: 15 percent

Minor Components
Holter and similar soils: 0 to 2 percent
Soils that have slopes more than 60 percent: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland

Flooding: None
Available water capacity: Mainly 1.3 inches

Mocmont
Surface layer texture: Very channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.3 inches

Rock outcrop
Definition: Hard argillite bedrock

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

Management

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

Tolman Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and mountains
Parent material: Material derived from argillite and igneous bedrock
Slope range: 4 to 60 percent
Elevation range: 3,500 to 5,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Lithic Argiustolls

Typical Pedon

Tolman channery loam, in an area of Hauz-Sieben-Tolman channery loams, 8 to 45 percent slopes, in an area of rangeland, 1,040 feet south and 2,000 feet east of the northwest corner of sec. 3, T. 12 N., R. 5 W.

A—0 to 5 inches; brown (7.5YR 5/2) channery loam, dark brown (7.5YR 3/2) moist; moderate very thin platy parting to moderate very fine granular structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine roots; 20 percent channers; slightly acid; clear smooth boundary.

Bt—5 to 10 inches; light brown (7.5YR 6/4) very channery clay loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; many very fine roots; many very fine tubular and interstitial pores; many distinct clay films on faces of peds; 50 percent channers; neutral; gradual smooth boundary.

BC—10 to 19 inches; light brown (7.5YR 6/4) very channery loam, dark brown (7.5YR 4/4) moist; weak fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; 10 percent flagstones and 50 percent channers; neutral; gradual smooth boundary.

R—19 inches; fractured bedrock; few fine roots extending into vertical cracks; few thin lime coats on undersides of some rock fragments.

Range in Characteristics

Soil temperature: 39 to 44 degrees F
Depth to the lithic contact: 10 to 20 inches

A horizon
Hue: 7.5YR, 10YR, 2.5Y, or 5Y
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 2 or 3
Texture: Loam or sandy clay loam
Clay content: 18 to 30 percent
Content of rock fragments: 0 to 35 percent channers
Reaction: pH 6.1 to 7.8

Bt horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 4 to 6 dry; 2 to 4 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or sandy clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 35 to 60 percent—0 to 10 percent flagstones; 35 to 50 percent channers
Reaction: pH 6.1 to 7.8

BC horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 4 to 6 dry; 2 to 4 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or sandy clay loam
Clay content: 20 to 35 percent
Content of rock fragments: 35 to 60 percent—0 to 10 percent flagstones; 35 to 50 percent channers
Reaction: pH 6.1 to 7.8

363F—Tolman-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform: Mountains
Slope: 15 to 60 percent
Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Tolman and similar soils: 65 percent
Rock outcrop: 25 percent

Minor Components
Mocmont and similar soils: 0 to 2 percent
Hauz and similar soils: 0 to 2 percent
Sieben and similar soils: 0 to 2 percent
Very shallow soils: 0 to 2 percent
Soils that have slopes more than 60 percent: 0 to 2 percent

Major Component Description

Tolman
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 1.8 inches

Rock outcrop
Definition: Hard argillite bedrock

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

Management

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

Totelake Series

Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Permeability: Moderate to a depth of 11 inches and rapid below
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 3 percent
Elevation range: 4,400 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Typic Haplustepts

Typical Pedon

Totelake gravelly loam, 0 to 3 percent slopes, in an area of forestland, 1,400 feet north and 100 feet west of the southeast corner of sec. 16, T. 14 N., R. 8 W.

Oi—1 inch to 0; undecomposed and slightly decomposed forest litter of needles and twigs.
A—0 to 4 inches; pinkish gray (7.5YR 6/2) gravelly loam, dark brown (7.5YR 4/2) moist; moderate very thin platy parting to moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few coarse roots; many light gray silt and sand skeletans of faces of peds; 20 percent pebbles; slightly alkaline; clear smooth boundary.
Bw—4 to 11 inches; pinkish gray (7.5YR 6/2) very gravelly sandy loam, dark brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; 15 percent cobbles and 40 percent pebbles; few distinct lime coats on undersides of coarse rock fragments; slightly effervescent; slightly alkaline; gradual smooth boundary.
2C—11 to 60 inches; pinkish gray (7.5YR 6/2) extremely cobbly sand, dark brown (7.5YR 4/2) moist; single grain; loose, nonsticky, nonplastic; common fine and few medium roots to 24 inches and few fine and medium roots below; 25 percent cobbles and 45 percent pebbles; common distinct lime coats on undersides of rock fragments; disseminated lime; strongly effervescent; slightly alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

A horizon
Value: 4 to 6 dry; 2 to 4 moist
Chroma: 1 to 3
Clay content: 8 to 15 percent
Content of rock fragments: 15 to 35 percent—0 to 15 percent stones and cobbles; 15 to 20 percent pebbles
Reaction: pH 6.6 to 7.8

Bw horizon
Hue: 10YR or 7.5YR
Value: 5 or 6 dry; 4 or 5 moist

Chroma: 2 to 4
Clay content: 5 to 10 percent
Content of rock fragments: 35 to 60 percent—0 to 15 percent stones and cobbles; 35 to 45 percent pebbles
Reaction: pH 6.6 to 7.8

2C horizon
Hue: 10YR or 7.5YR
Value: 6 or 7 dry; 4 to 6 moist
Chroma: 2 or 3
Texture: Loamy sand or sand
Clay content: 0 to 10 percent
Content of rock fragments: 60 to 80 percent—15 to 25 percent stones and cobbles; 45 to 55 percent pebbles
Reaction: pH 6.6 to 7.8

6A—Totelake gravelly loam, 0 to 3 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 3 percent
Elevation: 4,400 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Totelake and similar soils: 95 percent

Minor Components
Very poorly drained soils: 0 to 2 percent
Poorly drained soils: 0 to 1 percent
Soils that have slopes more than 3 percent: 0 to 1 percent
Soils with very cobbly loam surface layer: 0 to 1 percent

Major Component Description

Surface layer texture: Gravelly loam
Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained
Dominant parent material: Alluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 2.3 inches

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

Management

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

Trapps Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Mountains
Parent material: Colluvium derived from limestone and argillite rock or alpine till
Slope range: 8 to 60 percent
Elevation range: 4,500 to 6,000 feet
Mean annual precipitation: 15 to 25 inches
Frost-free period: 70 to 110 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Trapps channery loam, 25 to 60 percent slopes, in an area of forestland, 1,000 feet south and 1,500 feet east of the northwest corner of sec. 28, T. 16 N., R. 6 W.

Oi—1 inch to 0; forest litter of partially decomposed needles and twigs.
E—0 to 4 inches; pink (7.5YR 7/4) channery loam, brown (7.5YR 5/4) moist; moderate very thin platy parting to moderate very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots; 25 percent channers; slightly alkaline; clear smooth boundary.
Bt—4 to 20 inches; reddish yellow (7.5YR 6/6) very channery clay loam, strong brown (7.5YR 4/6) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds; 40 percent channers; slightly alkaline; gradual smooth boundary.
Bk1—20 to 40 inches; pink (7.5YR 7/4) very channery loam, strong brown (7.5YR 5/6) moist; moderate very fine and fine granular structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; 20 percent flagstones and

40 percent channers; disseminated lime; continuous prominent lime casts on undersides of coarse rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.
Bk2—40 to 60 inches; pink (7.5YR 7/4) extremely channery loam, brown (7.5YR 5/4) moist; moderate very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine roots; common very fine tubular and interstitial pores; 20 percent flagstones and 50 percent channers; disseminated lime; continuous prominent lime casts on undersides of coarse rock fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the Bk horizon: 15 to 35 inches

E horizon
Value: 6 or 7 dry; 5 or 6 moist
Chroma: 2 to 4
Clay content: 10 to 15 percent
Content of rock fragments: 15 to 35 percent—0 to 20 percent stones, flagstones, or cobbles; 15 to 25 percent pebbles or channers
Reaction: pH 5.6 to 7.3

Bt horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 to 7 dry; 3 to 5 moist
Chroma: 2 to 4 or 6
Clay content: 27 to 35 percent
Content of rock fragments: 35 to 60 percent—0 to 10 percent flagstones or cobbles; 35 to 50 percent pebbles or channers
Reaction: pH 6.6 to 8.4

Bk1 horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 6 to 8 dry; 5 or 6 moist
Chroma: 2 to 4, 6, or 8
Texture: Loam or sandy loam
Clay content: 10 to 15 percent
Content of rock fragments: 35 to 60 percent—0 to 20 percent stones, flagstones, or cobbles; 35 to 40 percent pebbles or channers
Calcium carbonate equivalent: 20 to 40 percent
Reaction: pH 7.9 to 8.4

Bk2 horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 6 to 8 dry; 5 or 6 moist
Chroma: 2 to 4, 6, or 8
Texture: Loam or sandy loam
Clay content: 10 to 15 percent
Content of rock fragments: 45 to 85 percent—10 to 30 percent stones, flagstones, or cobbles; 50 to 55 percent pebbles or channers
Calcium carbonate equivalent: 20 to 30 percent
Reaction: pH 7.9 to 8.4

484F—Trapps channery loam, 25 to 60 percent slopes

Setting

Landform: Mountains
Slope: 25 to 60 percent
Elevation: 4,600 to 6,000 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 80 to 105 days

Composition

Major Components
Trapps and similar soils: 90 percent

Minor Components
Whitecow and similar soil: 0 to 3 percent
Areas of rock outcrop: 0 to 3 percent
Moderately deep soils: 0 to 2 percent
Shallow soils: 0 to 2 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

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

Management

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

584D—Trapps stony loam, 8 to 25 percent slopes

Setting

Landform: Mountains
Slope: 8 to 25 percent
Elevation: 4,600 to 5,000 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 70 to 100 days

Composition

Major Components
Trapps and similar soils: 95 percent

Minor Components
Soils that have slopes more than 25 percent: 0 to 2 percent
Moderately deep soils: 0 to 1 percent
Soils with no lime: 0 to 1 percent
Soils with less rock fragments: 0 to 1 percent

Major Component Description

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

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

Management

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

984F—Trapps-Warneke channery loams, 25 to 60 percent slopes

Setting

Landform:
- Trapps—Mountains
- Warneke—Mountains

Position on landform:
- Trapps—Backslopes and footslopes
- Warneke—Backslopes and shoulders

Slope:
- Trapps—25 to 60 percent
- Warneke—25 to 60 percent

Elevation: 4,600 to 6,000 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 80 to 100 days

Composition

Major Components
Trapps and similar soils: 70 percent
Warneke and similar soils: 25 percent

Minor Components
Whitecow and similar soils: 0 to 2 percent
Soils that have slopes more than 60 percent: 0 to 1 percent
Very shallow soils: 0 to 1 percent
Noncalcareous shallow soils: 0 to 1 percent

Major Component Description

Trapps
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

Warneke
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Forestland
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.

Management

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

985F—Trapps-Whitecow-Warneke channery loams, 25 to 60 percent slopes

Setting

Landform:
- Trapps—Mountains
- Whitecow—Mountains
- Warneke—Mountains

Position on landform:
- Trapps—Backslopes and footslopes
- Whitecow—Backslopes and footslopes
- Warneke—Backslopes and shoulders

Slope:
- Trapps—25 to 60 percent
- Whitecow—25 to 60 percent
- Warneke—25 to 60 percent

Elevation: 4,600 to 6,000 feet
Mean annual precipitation: 18 to 25 inches
Frost-free period: 80 to 100 days

Composition

Major Components
Trapps and similar soils: 40 percent
Whitecow and similar soils: 35 percent
Warneke and similar soils: 20 percent

Minor Components
Areas of rock outcrop: 0 to 1 percent
Very shallow soils: 0 to 1 percent
Noncalcareous shallow soils: 0 to 1 percent
Moderately deep soils: 0 to 1 percent
Soils with grass vegetation: 0 to 1 percent

Major Component Description

Trapps
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

Whitecow
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.9 inches

Warneke
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Forestland
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.

Management

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

Tropal Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Material derived from limestone
Slope range: 25 to 60 percent
Elevation range: 5,000 to 7,500 feet
Mean annual precipitation: 19 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, carbonatic Lithic Eutrocryepts

Typical Pedon

Tropal very gravelly loam, in an area of Tropal-Rock outcrop complex, 25 to 60 percent slopes, in an area of rangeland, 2,400 feet south and 800 feet east of the northwest corner of sec. 31, T. 19 N., R. 7 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine roots; 15 percent angular cobbles and 40 percent angular pebbles; slightly alkaline; clear smooth boundary.

Bw—4 to 13 inches; brown (10YR 5/3) extremely gravelly loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky parting to weak fine and medium granular structure; soft, very friable, slightly sticky, nonplastic; many very fine roots; many very fine tubular and interstitial pores; 70 percent angular pebbles; continuous faint lime coats on undersides of pebbles in lower part; slightly alkaline; clear smooth boundary.

Bk—13 to 19 inches; pale brown (10YR 6/3) extremely gravelly loam, brown (10YR 5/3) moist; weak very fine and fine granular structure; soft, very friable, slightly sticky, nonplastic; common very fine roots; many very fine tubular and interstitial pores; 10 percent angular cobbles and 60 percent angular pebbles; continuous faint lime casts on undersides of pebbles; disseminated lime; violently effervescent; slightly alkaline; clear smooth boundary.

R—19 inches; hard limestone bedrock with few cracks; few fine roots in some cracks.

Range in Characteristics

Soil temperature: 38 to 42 degrees F
Depth to bedrock: 10 to 20 inches

A horizon
Hue: 10YR or 2.5Y
Value: 4 or 5 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 15 to 25 percent

Content of rock fragments: 35 to 60 percent—0 to 15 percent stones and cobbles; 35 to 45 percent pebbles
Calcium carbonate equivalent: 0 to 5 percent
Reaction: pH 7.4 to 8.4

Bw horizon
Hue: 10YR or 2.5Y
Value: 5 to 8 dry; 4 to 7 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Content of rock fragments: 35 to 80 percent
Reaction: pH 7.4 to 8.4

Bk horizon
Hue: 10YR or 2.5Y
Value: 5 to 8 dry; 5 to 7 moist
Chroma: 2 or 3
Clay content: 10 to 20 percent
Content of rock fragments: 35 to 80 percent—10 to 20 percent stones and cobbles; 25 to 60 percent pebbles
Calcium carbonate equivalent: 40 to 50 percent
Reaction: pH 7.4 to 8.4

177F—Tropal-Rock outcrop complex, 25 to 60 percent slopes

Setting

Landform: Mountains
Position on landform:
- Tropal—Backslopes
- Rock outcrop—Shoulders

Slope: 25 to 60 percent
Elevation: 5,000 to 7,500 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Tropal and similar soils: 65 percent
Rock outcrop: 25 percent

Minor Components
Whitore and similar soils: 0 to 4 percent
Soils that have slopes more than 60 percent: 0 to 3 percent
Moderately deep soils: 0 to 3 percent

Major Component Description

Tropal
Surface layer texture: Very gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.1 inches

Rock outcrop
Definition: Limestone bedrock

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

Management

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

Turrah Series

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Slow
Landform: Stream terraces
Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Fine, mixed, superactive, frigid Cumulic Endoaquolls

Typical Pedon

Turrah silty clay, 0 to 2 percent slopes, in an area of irrigated pasture, 900 feet south and 1,100 feet west of the northeast corner of sec. 34, T. 14 N., R. 9 W.

Oi—3 inches to 0; slightly decomposed organic layer of plant roots.
A1—0 to 3 inches; very dark gray (5Y 3/1) silty clay, dark gray (5Y 4/1) dry; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; many very fine roots; slightly acid; clear smooth boundary.
A2—3 to 15 inches; black (5Y 2.5/1) silty clay, dark gray (5Y 4/1) dry; moderate medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; slightly acid; clear smooth boundary.
Bg1—15 to 20 inches; very dark gray (5Y 3/1) silty clay loam, gray (5Y 5/1) dry; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and

interstitial pores; slightly acid; clear smooth boundary.
Bg2—20 to 31 inches; black (5Y 2.5/1) silty clay, dark gray (5Y 4/1) dry; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; slightly acid; gradual smooth boundary.
Bg3—31 to 39 inches; gray (5Y 5/1) clay, gray (5Y 6/1) dry; common fine and medium prominent strong brown (7.5YR 5/6) moist redox concentrations; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; slightly acid; clear smooth boundary.
2Cg—39 to 60 inches; dark grayish brown (2.5Y 4/2) extremely cobbly sandy loam, light brownish gray (2.5Y 6/2) dry; massive; slightly hard, very friable, slightly sticky, nonplastic; few very fine roots; 35 percent cobbles and 35 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Thickness of the mollic epipedon: 24 to 48 inches
Depth to the seasonal high water table: 12 to 24 inches

A1 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 2, 2.5, or 3 moist; 2 to 4 dry
Chroma: 1 or 2
Clay content: 40 to 60 percent
Reaction: pH 5.6 to 7.3

A2 horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 2, 2.5, or 3 moist; 2 to 4 dry
Chroma: 1 or 2
Texture: Clay, silty clay loam, or silty clay
Clay content: 40 to 60 percent
Reaction: pH 5.6 to 7.3

Bg horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 2, 2.5, 3 to 5 moist; 4 to 6 dry
Chroma: 0 to 3
Redox concentrations: 10YR 4/4, 10YR 4/6, 10YR 5/6, 10YR 6/4, 10YR 6/6, or 7.5YR 5/6
Texture: Clay, silty clay, silty clay loam, or clay loam
Clay content: 35 to 60 percent
Reaction: pH 6.6 to 7.8

2Cg horizon
Hue: 2.5Y or 5Y
Value: 4 or 5 moist; 4 to 6 dry
Chroma: 1 or 2
Texture: Sandy clay loam, sandy loam, or clay loam
Clay content: 20 to 40 percent
Content of rock fragments: 35 to 85 percent—15 to 35 percent cobbles; 20 to 50 percent pebbles
Reaction: pH 6.6 to 7.8

417A—Turrah silty clay, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Composition

Major Components
Turrah and similar soils: 90 percent

Minor Components
Very poorly drained soils: 0 to 5 percent
Soils with sand and gravel at 30 inches: 0 to 2 percent
Somewhat poorly drained soils: 0 to 2 percent
Soils with silty clay loam surface layers: 0 to 1 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 12 to 24 inches
Available water capacity: Mainly 7.7 inches

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

Management

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

Typic Haplustepts

Depth class: Deep (40 to 60 inches) or very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium derived from argillite
Slope range: 25 to 60 percent
Elevation range: 4,000 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Typic Haplustepts

Typical Pedon

Fine-loamy, mixed Typic Ustochrepts in an area of Typic Haplustepts-Tolex complex, 25 to 60 percent slopes, in an area of forestland, 1,100 feet north and 1,000 feet west of the southeast corner of sec. 29, T. 18 N., R. 6 W.

O—1 inch to 0; forest litter of partially decomposed needles, twigs, and leaves.
A1—0 to 6 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy parting to moderate very fine granular structure; soft, very friable, moderately sticky, slightly plastic; many very fine and fine and few medium roots; slightly alkaline; clear smooth boundary.
Bw1—6 to 25 inches; light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) moist; weak coarse prismatic parting to weak coarse angular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; slightly alkaline; gradual smooth boundary.
Bw2—25 to 60 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; weak coarse prismatic structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; 1 percent pebbles; few faint lime casts on undersides of pebbles; slightly alkaline.

Range in Characteristics

Depth to bedrock or hard shale: 40 inches or more
Content of rock fragments in the control section: 0 to 35 percent cobbles and pebbles

195F—Typic Haplustepts-Tolex complex, 25 to 60 percent slopes

Setting

Landform:
- Typic Ustochrepts—Mountains
- Tolex—Mountains

Position on landform:
- Typic Ustochrepts—Backslopes and footslopes
- Tolex—Backslopes and shoulders

Slope:
- Typic Ustochrepts—25 to 60 percent
- Tolex—25 to 60 percent

Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Typic Haplustepts and similar soils: 70 percent
Tolex and similar soils: 15 percent

Minor Components
Soils that are clayey textured: 0 to 4 percent
Soils that have slopes more than 60 percent: 0 to 4 percent
Moderately deep soils: 0 to 4 percent
Soils with darker colored surface layers: 0 to 3 percent

Major Component Description

Typic Haplustepts
Surface layer texture: Loam
Drainage class: Well drained
Dominant parent material: Argillite colluvium
Native plant cover type: Forestland
Flooding: None

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

Typic Ustifluvents

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained or moderately well drained
Permeability: Variable
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 3,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days
Flooding: Rare to occasional

Taxonomic Class: Typic Ustifluvents

Typical Pedon

Typic Ustifluvents, in an area of Typic Ustifluvents-Fluvaquentic Haplustolls complex, 0 to 4 percent slopes, in an area of cropland, 2,000 feet north and 100 feet west of the southeast corner of sec. 2, T. 17 N., R. 4 W.

Ap—0 to 6 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; weak medium angular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C1—6 to 28 inches; light brownish gray (2.5Y 6/2) loam with thin strata of silt loam and sandy loam, dark grayish brown (2.5Y 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

C2—28 to 31 inches; light brownish gray (2.5Y 6/2) sandy loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, very friable, slightly sticky, nonplastic; common very fine roots; common very fine tubular and interstitial pores; disseminated lime; strongly effervescent; moderately alkaline; clear smooth boundary.

2C3—31 to 60 inches; light brownish gray (2.5Y 6/2) extremely gravelly sand, dark grayish brown (2.5Y 4/2) moist; single grain; loose, nonsticky, nonplastic; strongly effervescent; mildly alkaline.

Range in Characteristics

Ap horizon
Texture: Loam or clay loam
Content of rock fragments: 0 to 35 percent pebbles

C1 horizon
Texture: Loam, clay loam, or gravelly sandy loam to a depth of 20 inches and loam to extremely gravelly sand below

C2 and 2C3 horizons
Texture: Loam, clay loam, or gravelly sandy loam to a depth of 20 inches and loam to extremely gravelly sand below

301B—Typic Ustifluvents, 0 to 4 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 4 percent
Elevation: 3,800 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Typic Ustifluvents and similar soils: 90 percent

Minor Components
Somewhat poorly drained soils: 0 to 3 percent
Poorly drained soils: 0 to 3 percent
Very deep loamy soils: 0 to 3 percent
Soils with less rock fragments: 0 to 1 percent

Major Component Description

Dominant parent material: Alluvium
Flooding: Occasional

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

Management

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

601B—Typic Ustifluvents-Fluvaquentic Haplustolls complex, 0 to 4 percent slopes

Setting

Landform:
- Typic Ustifluvents—Flood plains
- Fluvaquentic Haplustolls—Flood plains

Slope:
- Typic Ustifluvents—0 to 4 percent
- Fluvaquentic Haplustolls—0 to 4 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Typic Ustifluvents and similar soils: 50 percent
Fluvaquentic Haplustolls and similar soils: 40 percent

Minor Components
Soils that have slopes more than 4 percent: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Typic Ustifluvents
Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Occasional

Fluvaquentic Haplustolls
Depth class: Very deep (more than 60 inches)
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare

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

Management

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

Vanda Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Very slow
Landform: Alluvial fans
Parent material: Alluvium
Slope range: 0 to 3 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, smectitic, calcareous, frigid Torrertic Ustorthents

Typical Pedon

Vanda silty clay, 0 to 3 percent slopes, in an area of rangeland, 2,400 feet south and 2,400 feet east of the northwest corner of sec. 21, T. 21 N., R. 7 W.

A1—0 to 1 inch; light gray (5Y 7/1) silty clay, gray (5Y 5/1) moist; thin massive crust that has fine granules on undersides; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine and fine vesicular pores; 10 percent pebbles; disseminated lime; strongly effervescent; strongly alkaline; abrupt smooth boundary.

A2—1 to 2 inches; gray (5Y 6/1) silty clay, gray (5Y 5/1) moist; weak very fine and fine granular structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; strongly alkaline; clear smooth boundary.

Bw—2 to 6 inches; light olive gray (5Y 6/2) silty clay, olive gray (5Y 4/2) moist; weak medium angular blocky parting to weak thin platy structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; strongly alkaline; clear smooth boundary.

By—6 to 30 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine and medium subangular blocky structure; very hard, firm, moderately sticky, moderately plastic; common very fine roots; common very fine tubular and interstitial pores; common fine seams and masses of gypsum; common fine and medium dead roots; disseminated lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

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

Range in Characteristics

Soil temperature: 42 to 47 degrees F

A and Bw horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 1 to 3
Clay content: 40 to 60 percent
Electrical conductivity: 2 to 8 mmhos/cm
Sodium adsorption ratio: 20 to 30
Reaction: pH 7.8 to 9.6

By horizon
Hue: 10YR, 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 16 mmhos/cm
Sodium adsorption ratio: 13 to 30
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.8 to 9.6

Byz horizon
Hue: 10YR, 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 16 mmhos/cm
Sodium adsorption ratio: 13 to 30
Gypsum content: 1 to 5 percent
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.8 to 9.6

505A—Vanda silty clay, 0 to 3 percent slopes

Setting

Landform: Alluvial fans
Slope: 0 to 3 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Vanda and similar soils: 90 percent

Minor Components
Very strongly saline soils: 0 to 5 percent
Somewhat poorly drained soils: 0 to 5 percent

Major Component Description

Surface layer texture: Silty clay
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

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

Management

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

Vebar Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Moderately rapid
Landform: Sedimentary plains
Parent material: Material derived from semiconsolidated sandstone
Slope range: 2 to 8 percent
Elevation range: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Coarse-loamy, mixed, superactive, frigid Typic Haplustolls

Typical Pedon

Vebar fine sandy loam, in an area of Vebar-Cuniff fine sandy loams, 2 to 8 percent slopes, in an area of rangeland, 1,500 feet north and 2,400 feet east of the southwest corner of sec. 15, T. 19 N., R. 7 W.

A1—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, slightly sticky, nonplastic; many very fine roots; slightly alkaline; clear smooth boundary.

A2—6 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky, nonplastic; many very fine roots; many very fine tubular and interstitial pores; slightly alkaline; gradual smooth boundary.

Bw—10 to 17 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; weak medium prismatic structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots; many very fine tubular and interstitial pores; slightly alkaline; gradual smooth boundary.
BC—17 to 28 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse angular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; few distinct lime coats on faces of peds; strongly effervescent; moderately alkaline; clear smooth boundary.
Cr—28 to 60 inches; light olive gray (5Y 6/2) semiconsolidated sandy sedimentary beds, olive gray (5Y 5/2) moist; strongly effervescent.

Range in Characteristics

Soil temperature: 41 to 47 degrees F
Depth to the paralithic contact: 20 to 40 inches

A horizons
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 2 or 3
Clay content: 10 to 18 percent
Reaction: pH 6.1 to 7.8

Bw horizon
Hue: 10YR or 2.5Y
Value: 4 to 6 dry; 3 or 4 moist
Chroma: 2 or 3
Texture: Fine sandy loam, sandy loam, or loam
Clay content: 10 to 18 percent
Reaction: pH 6.1 to 8.4

BC horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Sandy loam, fine sandy loam, loamy fine sand, or fine sand
Clay content: 7 to 15 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 6.1 to 8.4

239C—Vebar-Cuniff fine sandy loams, 2 to 8 percent slopes

Setting

Landform:
- Vebar—Sedimentary plains
- Cuniff—Sedimentary plains

Position on landform:
- Vebar—Backslopes and footslopes
- Cuniff—Shoulders

Slope:
- Vebar—2 to 8 percent
- Cuniff—2 to 8 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Vebar and similar soils: 65 percent
Cuniff and similar soils: 30 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Soils with loam textures: 0 to 2 percent
Areas of blowouts: 0 to 1 percent

Major Component Description

Vebar
Surface layer texture: Fine sandy loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.2 inches

Cuniff
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.

Management

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

Villard Series

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Moderately slow to a depth of 30 inches and rapid below
Landform: Flood plains

Parent material: Alluvium
Slope range: 0 to 2 percent
Elevation range: 3,600 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, frigid Typic Endoaquepts

Typical Pedon

Villard silt loam, in an area of Villard-Villy silt loams, 0 to 2 percent slopes, in an area of pasture, 700 feet south and 2,100 feet east of the northwest corner of sec. 10, T. 10 N., R. 3 W.

Oi—2 inches to 0; undecomposed and slightly decomposed layer of fibric material; slightly effervescent; mildly alkaline; clear smooth boundary.

Ag—0 to 3 inches; dark gray (10YR 4/1) silt loam, gray (10YR 5/1) dry; common fine prominent dark brown (7.5YR 4/4) mottles moist; moderate thin platy structure; hard, friable, moderately sticky, slightly plastic; many very fine and fine roots; many very fine tubular and interstitial pores; 5 percent pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.

Bg1—3 to 8 inches; dark gray (10YR 4/1) silty clay loam, gray (10YR 6/1) dry; common fine prominent dark brown (7.5YR 4/4) moist redox concentrations; weak thin platy structure; hard, friable, moderately sticky, moderately plastic; many very fine roots; common very fine tubular and interstitial pores; slightly effervescent; neutral; clear smooth boundary.

Bg2—8 to 19 inches; olive gray (5Y 5/2) silty clay loam, light gray (5Y 7/2) dry; many fine and medium prominent brownish yellow (10YR 4/6) moist redox concentrations; weak thin platy structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; common very fine tubular and interstitial pores; slightly effervescent; slightly alkaline; gradual smooth boundary.

Bg3—19 to 30 inches; gray (5Y 5/1) loam, gray (5Y 6/1) dry; many fine and medium prominent strong brown (7.5YR 5/6) moist redox concentrations; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; neutral; clear smooth boundary.

2C—30 to 60 inches; dark brown (10YR 4/3) very gravelly sand, yellow (10YR 7/6) dry; single grain; loose, nonsticky, nonplastic; 55 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the 2C horizon: 20 to 40 inches
Depth to the seasonal high water table: 12 to 24 inches

Ag horizon
Hue: 10YR or 2.5Y
Value: 3 or 4 moist; 5 or 6 dry
Chroma: 1 or 2
Clay content: 20 to 27 percent
Effervescence: Slightly or strongly
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.9 to 8.4

Bg1 and Bg2 horizons
Hue: 10YR, 2.5Y, or 5Y; redox concentrations: 7.5YR or 10YR
Value: 4 or 5 moist; 6 or 7 dry
Chroma: 1 or 2; redox concentrations: 4 or 6
Clay content: 27 to 35 percent
Effervescence: Slightly or strongly
Reaction: pH 6.6 to 8.4

Bg3 horizon
Hue: 2.5Y or 5Y; redox concentrations: 7.5YR or 10YR
Value: 4 or 5 moist; 5 or 6 dry
Chroma: 1 or 2; redox concentrations: 4 or 6
Texture: Loam or silt loam
Clay content: 15 to 27 percent
Reaction: pH 6.6 to 7.3

2C horizon
Texture: Sand or loamy sand
Clay content: 0 to 10 percent
Content of rock fragments: 50 to 80 percent—0 to 5 percent cobbles; 50 to 75 percent pebbles
Reaction: pH 6.6 to 7.3

408A—Villard-Villy silt loams, 0 to 2 percent slopes

Setting

Landform:
- Villard—Flood plains
- Villy—Flood plains

Slope:
- Villard—0 to 2 percent
- Villy—0 to 2 percent

Elevation: 3,600 to 4,200 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Villard and similar soils: 70 percent
Villy and similar soils: 20 percent

Minor Components
Very poorly drained soils: 0 to 5 percent
Moderately well drained soils: 0 to 3 percent
Soils that are shallow to sand and gravel: 0 to 2 percent

Major Component Description

Villard
Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 12 to 24 inches
Available water capacity: Mainly 6.2 inches

Villy
Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 0 to 24 inches
Available water capacity: Mainly 11.4 inches

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

Management

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

Villy Series

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Alluvium
•*Slope range:* 0 to 2 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-silty, mixed, superactive, calcareous, frigid Typic Fluvaquents

Typical Pedon

Villy silty clay loam, 0 to 2 percent slopes, in an area of pasture, 400 feet south and 1,600 feet east of the northwest corner of sec. 8, T. 6 N., R. 2 E. (Broadwater County, Montana)

Oi—2 inches to 0; root mat consisting of many live fibrous roots; abrupt smooth boundary.
A—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, light gray (10YR 6/2) dry; moderate thin platy structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; moderately alkaline (pH 8.4); clear smooth boundary.
Cg1—7 to 22 inches; gray (N 5/) silty clay loam, light gray (N 7/) dry; massive; hard, friable, moderately sticky, moderately plastic; common very fine and fine roots; many very fine tubular and interstitial pores; disseminated lime; strongly effervescent; moderately alkaline (pH 8.4); clear smooth boundary.
Cg2—22 to 34 inches; dark gray (N 4/) silty clay loam, gray (N 6/) dry; massive; hard, friable, moderately sticky, slightly plastic; few very fine roots; common very fine tubular and interstitial pores; disseminated lime; strongly effervescent; moderately alkaline (pH 8.3); gradual smooth boundary.
2Abg—34 to 40 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; massive; slightly hard, friable, slightly sticky, slightly plastic; few very fine roots; disseminated lime; strongly effervescent; moderately alkaline (pH 8.2); clear smooth boundary.
2Cbg—40 to 60 inches; gray (5Y 5/1) silty clay loam, light gray (5Y 7/1) dry; massive; hard, friable, moderately sticky, slightly plastic; disseminated lime; strongly effervescent; moderately alkaline (pH 8.2).

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the seasonal high water table: 0 to 24 inches

A horizon
Hue: 10YR or 2.5Y
Value: 3 to 5 moist; 5 to 7 dry
Chroma: 1 or 2
Texture: Silt loam or silty clay loam

Clay content: 18 to 35 percent
Reaction: pH 7.9 to 8.4

Cg and 2Cbg horizons
Hue: 10YR, 2.5Y, 5Y, or N
Value: 4 to 6 moist; 6 to 8 dry
Chroma: 0 to 2
Texture: Silt loam, silty clay loam, or very fine sandy loam
Clay content: 18 to 35 percent
Redox features: 7.5YR 4/2, 4/4 or 5Y 4/2, 4/3
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

2Abg horizon
Hue: 10YR or 2.5Y
Value: 3 or 4 moist; 4 or 5 dry
Chroma: 0 to 3
Texture: Silt loam or silty clay loam
Clay content: 18 to 35 percent
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.9 to 8.4

308A—Villy silt loam, 0 to 2 percent slopes

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Villy and similar soils: 95 percent

Minor Components
Fairway and similar soils: 0 to 2 percent
Very poorly drained soils: 0 to 2 percent
Soils deep to sand and gravel: 0 to 1 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Rare
Depth to the seasonal high water table: Apparent, 0 to 24 inches
Available water capacity: Mainly 11.4 inches

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

Management

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

808A—Villy silt loam, 0 to 2 percent slopes, very rarely flooded

Setting

Landform: Flood plains
Slope: 0 to 2 percent
Elevation: 3,600 to 4,000 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Villy and similar soils: 95 percent

Minor Components
Villy undrained soils: 0 to 3 percent
Soils with sand and gravel at 40 inches: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: Very rare
Depth to the seasonal high water table: Apparent, 0 to 24 inches
Available water capacity: Mainly 11.4 inches

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

Management

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

Wabek Series

Depth class: Very deep (more than 60 inches)
Drainage class: Excessively drained

Permeability: Moderate to a depth of 10 inches and rapid below
Landform: Alluvial fans and stream terraces
Parent material: Alluvium
Slope range: 0 to 4 percent
Elevation range: 4,500 to 4,800 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 80 days

Taxonomic Class: Sandy-skeletal, mixed, frigid Entic Haplustolls

Typical Pedon

Wabek very gravelly loam, in an area of Stady-Wabek complex, 1 to 4 percent slopes, in an area of rangeland, 2,000 feet north and 50 feet east of the southwest corner of sec. 22, T. 14 N., R. 9 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) very gravelly loam, black (10YR 2/1) moist; moderate thin platy parting to moderate fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 50 percent pebbles; neutral; clear smooth boundary.
A2—2 to 10 inches; dark grayish brown (10YR 4/2) very gravelly loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 55 percent pebbles; neutral; clear smooth boundary.
A3—10 to 15 inches; dark grayish brown (10YR 4/2) extremely gravelly loamy sand, very dark grayish brown (10YR 3/2) moist; loose, nonsticky, nonplastic; common very fine roots; 5 percent cobbles and 55 percent pebbles; neutral; clear smooth boundary.
Bk—15 to 45 inches; light brownish gray (10YR 6/2) extremely gravelly sand, dark grayish brown (10YR 4/2) moist; loose, nonsticky, nonplastic; common very fine roots to 22 inches and few below 22 inches; 75 percent pebbles; common distinct lime casts on undersides of rock fragments; slightly effervescent; neutral; gradual smooth boundary.
C—45 to 60 inches; light brownish gray (10YR 6/2) extremely gravelly sand, dark grayish brown (10YR 4/2) moist; loose, nonsticky, nonplastic; few very fine roots; 75 percent pebbles; slightly alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F

A horizons
Value: 3 to 5 dry; 2 or 3 moist
Chroma: 1 to 3
Clay content: 10 to 20 percent
Content of rock fragments: 15 to 60 percent—0 to 5 percent cobbles; 15 to 55 percent pebbles
Reaction: pH 6.6 to 9.0

Bk horizon
Hue: 10YR or 2.5Y
Value: 4 to 8 dry; 2 to 6 moist
Chroma: 2 to 4
Texture: Sand, loamy coarse sand, coarse sandy loam, sandy loam, loamy sand, or loam
Clay content: 0 to 3 percent
Content of rock fragments: 35 to 75 percent pebbles
Reaction: pH 7.4 to 9.0

C horizon
Hue: 10YR or 2.5Y
Value: 4 to 7 dry; 3 to 6 moist
Chroma: 2 to 4
Texture: Sand, coarse sand, loamy coarse sand, or loamy sand
Clay content: 0 to 3 percent
Content of rock fragments: 35 to 75 percent pebbles
Reaction: pH 7.4 to 9.0

Warneke Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and mountains
Parent material: Material derived from limestone
Slope range: 15 to 60 percent
Elevation range: 4,000 to 6,000 feet
Mean annual precipitation: 15 to 25 inches
Frost-free period: 80 to 110 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid Lithic Calciustepts

Typical Pedon

Warneke gravelly loam, in an area of Warneke-Rock outcrop complex, 15 to 60 percent slopes, in an area of forestland, 2,500 feet north and 1,000 feet west of the southeast corner of sec. 31, T. 11 N., R. 5 W.

A—0 to 4 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist;

weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine and few medium roots; 20 percent angular pebbles; slightly alkaline; clear smooth boundary.

Bk1—4 to 10 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine and fine and few medium roots; many very fine tubular and interstitial pores; 15 percent angular cobbles and 40 percent angular pebbles; disseminated lime; violently effervescent; moderately alkaline; clear smooth boundary.

Bk2—10 to 16 inches; light gray (10YR 7/2) extremely cobbly loam, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine roots; many very fine tubular and interstitial pores; 20 percent angular cobbles and 40 percent angular pebbles; common fine soft masses of lime; common distinct lime casts on undersides of rock fragments; violently effervescent; moderately alkaline; abrupt wavy boundary.

R—16 inches; hard limestone with few vertical cracks.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to bedrock: 10 to 20 inches

A horizon
- Hue: 2.5Y or 10YR
- Value: 4 to 6 dry; 3 to 5 moist
- Chroma: 2 or 3
- Clay content: 10 to 25 percent
- Content of rock fragments: 15 to 60 percent—0 to 10 percent flagstones or cobbles; 15 to 50 percent pebbles or channers
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.4 to 8.4

Bk horizons
- Hue: 2.5Y or 10YR
- Value: 6 or 7 dry; 5 or 6 moist
- Chroma: 2 to 4
- Texture: Loam or silt loam
- Clay content: 10 to 25 percent
- Content of rock fragments: 35 to 70 percent—0 to 20 percent stones and cobbles; 35 to 50 percent pebbles
- Calcium carbonate equivalent: 40 to 50 percent
- Reaction: pH 7.9 to 8.4

277F—Warneke-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform: Mountains
Position on landform:
- Warneke—Backslopes
- Rock outcrop—Backslopes and shoulders

Slope: 15 to 60 percent
Elevation: 4,500 to 6,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Warneke and similar soils: 70 percent
Rock outcrop: 20 percent

Minor Components
Whitecow and similar soils: 0 to 5 percent
Moderately deep soils: 0 to 5 percent

Major Component Description

Warneke
Surface layer texture: Gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 1.0 inches

Rock outcrop
Definition: Hard limestone bedrock

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

Management

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

W—Water

Composition

Major Components
Water: 100 percent

Major Component Description

Definition: Areas of open water

Wayden Series

Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Permeability: Slow
Landform: Hills
Parent material: Material derived from shale and mudstone
Slope range: 8 to 60 percent
Elevation range: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Clayey, smectitic, calcareous, frigid, shallow Typic Ustorthents

Typical Pedon

Wayden clay, in an area of Regent-Wayden-Cabba complex, 15 to 45 percent slopes, in an area of rangeland, 1,600 feet north and 2,400 feet west of the southeast corner of sec. 34, T. 21 N., R. 8 W.

A—0 to 4 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate very fine granular structure; hard, friable, moderately sticky, moderately plastic; many very fine roots; slightly alkaline; clear smooth boundary.
C1—4 to 10 inches; gray (5Y 6/1) silty clay, olive gray (5Y 4/2) moist; moderate fine and medium granular structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; 5 percent angular shale chips, strongly effervescent; slightly alkaline; clear smooth boundary.
C2—10 to 15 inches; gray (5Y 6/1) clay, greenish gray (5GY 5/1) moist; moderate fine and medium granular structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; 60 percent soft shale chips, strongly effervescent; slightly alkaline; gradual smooth boundary.
Cr—15 to 60 inches; light greenish gray (5GY 7/1) semiconsolidated shale, greenish gray (5GY 5/1) moist; few very fine roots following vertical cracks in upper part, strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 40 to 47 degrees F
Depth to the Cr horizon: 10 to 20 inches

A horizon
Hue: 2.5Y or 5Y
Value: 5 to 7 dry; 3 to 5 moist
Chroma: 1 to 3
Clay content: 40 to 50 percent
Electrical conductivity: 0 to 4 mmhos/cm
Reaction: pH 7.4 to 8.4

C horizons
Hue: 2.5Y or 5Y
Value: 5 to 8 dry; 3 to 6 moist
Chroma: 1 to 4
Texture: Silty clay, silty clay loam, or clay
Clay content: 35 to 50 percent
Electrical conductivity: 0 to 8 mmhos/cm
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

579E—Wayden-Cabba-Rock outcrop complex, 15 to 60 percent slopes

Setting

Landform:
- Wayden—Hills
- Cabba—Hills

Slope:
- Wayden—15 to 60 percent
- Cabba—15 to 60 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Wayden and similar soils: 45 percent
Cabba and similar soils: 40 percent
Rock outcrop: 10 percent

Minor Components
Very shallow soils: 0 to 2 percent
Moderately deep soils: 0 to 2 percent
Soils with gravelly loam surface layers: 0 to 1 percent

Major Component Description

Wayden
Surface layer texture: 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

Cabba
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 3.0 inches

Rock outcrop
Definition: Sandstone and shale bedrock

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

Management

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

679E—Wayden-Cabba-Regent complex, 15 to 45 percent slopes

Setting

Landform:
- Wayden—Hills
- Cabba—Hills
- Regent—Hills

Position on landform:
- Wayden—Backslopes and shoulders
- Cabba—Backslopes and shoulders
- Regent—Backslopes and footslopes

Slope:
- Wayden—15 to 45 percent
- Cabba—15 to 45 percent
- Regent—15 to 35 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Wayden and similar soils: 55 percent
Cabba and similar soils: 25 percent
Regent and similar soils: 15 percent

Minor Components
Farnuf and similar soils: 0 to 1 percent
Work and similar soils: 0 to 1 percent
Areas of rock outcrop: 0 to 1 percent
Very shallow soils: 0 to 1 percent
Soils with gravelly loam surface layers: 0 to 1 percent

Major Component Description

Wayden
Surface layer texture: 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

Cabba
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 3.0 inches

Regent
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Interbedded sandstone and shale residuum
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 5.0 inches

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

Management

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

Weingart Series

Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Permeability: Very slow
Landform: Hills and sedimentary plains
Parent material: Material derived from shale and semiconsolidated sedimentary beds
Slope range: 2 to 15 percent
Elevation range: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine, smectitic, frigid Torrertic Natrustalfs

Typical Pedon

Weingart clay loam, 2 to 8 percent slopes, in an area of rangeland, 2,500 feet north and 2,300 feet west of the southeast corner of sec. 12, T. 11 N., R. 5 W.

E—0 to 4 inches; light gray (10YR 7/2) loam, dark grayish brown (10YR 4/2) moist; moderate very thin platy structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; many very fine vesicular pores; neutral; abrupt smooth boundary.

Btn—4 to 10 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; strong medium columnar structure; very hard, firm, moderately sticky, and very plastic; common very fine roots; many very fine tubular pores; continuous prominent clay films on faces of peds; silt and sand skeletans on tops of columns; moderately alkaline; clear smooth boundary.

Btnk—10 to 17 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; moderate medium prismatic structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; common distinct dark brown clay films on faces of peds; common faint very pale brown (10YR 7/3) coats on faces of peds with common fine irregularly shaped soft masses of lime; strongly effervescent; strongly alkaline; gradual smooth boundary.

Bknyz—17 to 30 inches; pale yellow (5Y 7/3) silty clay loam, pale olive (5Y 6/3) moist; weak coarse prismatic structure; hard, friable, moderately sticky, moderately plastic; common very fine roots; common very fine tubular and interstitial pores; common fine seams of gypsum and other salts; common faint lime coats on faces of peds; violently effervescent; moderately alkaline; clear smooth boundary.

Cr—30 to 60 inches; reddish yellow (7.5YR 6/6) semiconsolidated sedimentary beds, strong brown (7.5YR 5/6) moist; few very fine roots in the upper part; common seams of gypsum; mildly alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 7 to 16 inches
Depth to gypsum and other salts: 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: Loam (clay loam when mixed to 7 inches)
- Clay content: 27 to 40 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 25
- Reaction: pH 6.6 to 9.6

Btnk horizon
- Hue: 10YR, 2.5Y, or 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 25
- Gypsum content: None to common seams, 0 to 2 percent
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.9 to 9.0

Bknyz horizon
- Hue: 2.5Y or 5Y
- Value: 5 to 7 dry; 4 to 6 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 10 percent—0 to 5 percent hard shale; 0 to 5 percent soft shale
- Electrical conductivity: 4 to 16 mmhos/cm
- Sodium adsorption ratio: 13 to 30
- Gypsum content: 1 to 5 percent
- Calcium carbonate equivalent: 5 to 15 percent
- Reaction: pH 7.8 to 9.6

Cr horizon
- Material: Semiconsolidated shale or interbedded shale and sandstone
- Reaction: Greater than 7.8

514B—Weingart-Assinniboine complex, 2 to 8 percent slopes

Setting

Landform:
- Weingart—Sedimentary plains
- Assinniboine—Alluvial fans

Slope:
- Weingart—2 to 8 percent
- Assinniboine—2 to 8 percent

Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Weingart and similar soils: 50 percent
Assinniboine and similar soils: 45 percent

Minor Components
Soils that have slopes more than 8 percent: 0 to 2 percent
Very deep loam soils: 0 to 2 percent
Moderately deep clayey soils: 0 to 1 percent

Major Component Description

Weingart
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, clayey sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.7 inches

Assinniboine
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 8.3 inches

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

Management

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

614B—Weingart clay loam, 2 to 8 percent slopes

Setting

Landform: Sedimentary plains
Slope: 2 to 8 percent
Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Weingart and similar soils: 95 percent

Minor Components
Soils that have slopes more than 8 percent: 0 to 3 percent
Deep clayey soils: 0 to 2 percent

Major Component Description

Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, clayey sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 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.

Management

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

714B—Weingart-Musselshell complex, 2 to 8 percent slopes

Setting

Landform:
- Weingart—Sedimentary plains
- Musselshell—Alluvial fans

Slope:
- Weingart—2 to 8 percent
- Musselshell—2 to 8 percent

Elevation: 3,800 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Weingart and similar soils: 45 percent
Musselshell and similar soils: 40 percent

Minor Components
Very deep clay loam soils: 0 to 5 percent
Soils with gravelly loam surface layers: 0 to 5 percent
Soils with more rock fragments: 0 to 5 percent

Major Component Description

Weingart
Surface layer texture: Clay loam
Depth class: Moderately deep (20 to 40 inches)
Drainage class: Well drained
Dominant parent material: Semiconsolidated, clayey sedimentary beds
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 3.7 inches

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

Management

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

Whitecow Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium derived from limestone
Slope range: 8 to 60 percent
Elevation range: 4,000 to 6,000 feet
Mean annual precipitation: 12 to 25 inches
Frost-free period: 80 to 115 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid Typic Calciustepts

Typical Pedon

Whitecow channery loam, 8 to 35 percent slopes, in an area of forestland, 1,500 feet south and 10 feet west of the northeast corner of sec. 15, T. 11 N., R. 5 W.

Oi—1 inch to 0; forest litter of needles and twigs; clear smooth boundary.
A—0 to 2 inches; light brownish gray (2.5Y 6/2) channery loam, dark grayish brown (2.5Y 4/2) moist; weak thin platy parting to weak very fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; common fine, medium, and coarse roots; 20 percent channers; strongly effervescent; moderately alkaline; abrupt smooth boundary.
Bk1—2 to 14 inches; light gray (10YR 7/2) channery loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common fine, medium, and coarse roots; 20 percent channers; disseminated lime; common distinct lime coats on undersides of rock fragments; violently effervescent; moderately alkaline; clear smooth boundary.
Bk2—14 to 24 inches; very pale brown (10YR 7/3) extremely channery loam, yellowish brown (10YR 5/4) moist; common medium faint olive yellow (2.5Y 6/6) mottles; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; common very fine and medium roots; 65 percent channers; disseminated lime; many prominent lime casts on undersides of rock fragments; violently effervescent; moderately alkaline; gradual wavy boundary.
Bk3—24 to 40 inches; pale yellow (2.5Y 7/4) extremely channery loam, olive yellow (2.5Y 6/6) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common fine and medium roots; 65 percent channers; disseminated lime; many faint lime casts on undersides of rock fragments; violently effervescent; moderately alkaline; gradual wavy boundary.
Bk4—40 to 60 inches; pale yellow (2.5Y 7/4) extremely channery loam, olive yellow (2.5Y 6/6) moist; massive; slightly hard, friable, slightly sticky, slightly plastic; few fine roots; 80 percent channers; disseminated lime; many faint lime casts on undersides of rock fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 38 to 42 degrees F

A horizon
Value: 4 to 6 dry; 3 or 4 moist
Chroma: 2 or 3
Clay content: 18 to 27 percent
Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles or channers
Calcium carbonate equivalent: 0 to 5 percent
Reaction: pH 7.4 to 8.4

Bk1 and Bk2 horizons
Hue: 10YR or 2.5Y
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 2 to 4
Texture: Loam or clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 35 to 70 percent—0 to 30 percent stones and cobbles; 5 to 60 percent pebbles or channers
Calcium carbonate equivalent: 35 to 50 percent
Reaction: pH 7.4 to 9.0

Bk3 and Bk4 horizons
Hue: 10YR or 2.5Y
Value: 6 to 8 dry; 4 to 7 moist
Chroma: 2 to 4 or 6
Texture: Loam, sandy loam, or clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 60 to 90 percent—5 to 30 percent stones and cobbles; 55 to 70 percent pebbles or channers
Calcium carbonate equivalent: 40 to 50 percent
Reaction: pH 7.4 to 9.0

85E—Whitecow channery loam, 8 to 35 percent slopes

Setting

Landform: Mountains
Slope: 8 to 35 percent
Elevation: 4,500 to 6,000 feet
Mean annual precipitation: 12 to 19 inches
Frost-free period: 90 to 115 days

Composition

Major Components
Whitecow and similar soils: 90 percent

Minor Components
Warneke and similar soils: 0 to 4 percent
Soils that have slopes more than 35 percent: 0 to 3 percent
Moderately deep soils: 0 to 3 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
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.

Management

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

85F—Whitecow channery loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,500 to 6,000 feet
Mean annual precipitation: 12 to 19 inches
Frost-free period: 90 to 105 days

Composition

Major Components
Whitecow and similar soils: 95 percent

Minor Components
Warneke and similar soils: 0 to 2 percent
Moderately deep soils: 0 to 2 percent
Soils that have slopes more than 60 percent: 0 to 1 percent

Major Component Description

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

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

Management

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

285F—Whitecow, cool-Trapps, dry channery loams, 25 to 60 percent slopes

Setting

Landform:
- Whitecow—Mountains
- Trapps—Mountains

Slope:
- Whitecow—25 to 60 percent
- Trapps—25 to 60 percent

Elevation: 4,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Whitecow and similar soils: 55 percent
Trapps and similar soils: 40 percent

Minor Components
Warneke and similar soils: 0 to 2 percent
Areas of rock outcrop: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Whitecow
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.9 inches

Trapps
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.7 inches

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

Management

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

385E—Whitecow-Tolex channery loams, 8 to 35 percent slopes

Setting

Landform:
- Whitecow—Mountains
- Tolex—Mountains

Position on landform:
- Whitecow—Backslopes and footslopes
- Tolex—Backslopes and shoulders

Slope:
- Whitecow—8 to 35 percent
- Tolex—8 to 35 percent

Elevation: 4,000 to 4,500 feet
Mean annual precipitation: 12 to 15 inches
Frost-free period: 90 to 115 days

Composition

Major Components
Whitecow and similar soils: 50 percent
Tolex and similar soils: 45 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 1 percent
Deep loam textured soils: 0 to 1 percent
Soils with cobbly loam surface layers: 0 to 1 percent

Major Component Description

Whitecow
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.9 inches

Tolex
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Argillite or igneous bedrock
Native plant cover type: Forestland
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.

Management

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

441E—Whitecow-Crago-Pensore channery loams, 8 to 35 percent slopes

Setting

Landform:
- Whitecow—Mountains
- Crago—Alluvial fans
- Pensore—Mountains

Position on landform:
- Whitecow—Backslopes and footslopes
- Crago—Footslopes
- Pensore—Backslopes and shoulders

Slope:
- Whitecow—8 to 35 percent
- Crago—8 to 35 percent
- Pensore—8 to 35 percent

Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 12 to 15 inches
Frost-free period: 105 to 115 days

Composition

Major Components
Whitecow and similar soils: 40 percent
Crago and similar soils: 30 percent
Pensore and similar soils: 20 percent

Minor Components
Soils that have slopes more than 35 percent: 0 to 3 percent
Areas of rock outcrop: 0 to 3 percent
Soils with less rock fragments: 0 to 2 percent
Moderately deep soils: 0 to 2 percent

Major Component Description

Whitecow
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.9 inches

Crago
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 3.5 inches

Pensore
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Rangeland
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.

Management

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

685F—Whitecow channery loam, cool, 25 to 60 percent slopes

Setting

Landform: Mountains
Slope: 25 to 60 percent
Elevation: 4,500 to 5,000 feet
Mean annual precipitation: 12 to 19 inches
Frost-free period: 90 to 115 days

Composition

Major Components
Whitecow and similar soils: 95 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Soils that have slopes more than 60 percent: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
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.

Management

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

885F—Whitecow-Warneke channery loams, 15 to 45 percent slopes

Setting

Landform:
- Whitecow—Mountains
- Warneke—Mountains

Position on landform:
- Whitecow—Backslopes and footslopes
- Warneke—Backslopes and shoulders

Slope:
- Whitecow—15 to 45 percent
- Warneke—15 to 45 percent

Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Whitecow and similar soils: 70 percent
Warneke and similar soils: 20 percent

Minor Components
Soils that have slopes more than 45 percent: 0 to 3 percent
Moderately deep soils: 0 to 3 percent
Soils with darker colored surface layers: 0 to 3 percent
Soils with grass vegetation: 0 to 1 percent

Major Component Description

Whitecow
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.9 inches

Warneke
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Forestland
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.

Management

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

Whitore Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Mountains
Parent material: Colluvium derived from limestone
Slope range: 15 to 60 percent
Elevation range: 5,000 to 7,000 feet
Mean annual precipitation: 19 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, carbonatic Typic Eutrocryepts

Typical Pedon

Whitore channery loam, in an area of Whitore-Helmville channery loams, 15 to 35 percent slopes, in an area of forestland, 2,300 feet south and 1,200 feet east of the northwest corner of sec. 9, T. 11 N., R. 5 W.

Oi—2 inches to 0; forest litter of needles and twigs; clear smooth boundary.
A—0 to 4 inches; pale brown (10YR 6/3) channery loam, dark grayish brown (10YR 4/2) moist; weak thin platy parting to weak very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium and coarse roots; many very fine interstitial pores; common light brownish gray (10YR 6/2) silt and sand skeletans on faces of peds; 30 percent channers; slightly alkaline; clear smooth boundary.
Bw—4 to 16 inches; pale brown (10YR 6/3) channery loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine and fine and few medium and coarse roots; many very fine tubular and interstitial pores; 30 percent channers; thin white lime casts on undersides of coarse rock fragments in lower part; strongly effervescent; slightly alkaline; gradual smooth boundary.

Bk1—16 to 45 inches; white (10YR 8/2) extremely channery loam, pale brown (10YR 6/3) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium and coarse roots; many very fine and fine tubular and interstitial pores; 65 percent channers; thick white lime casts on undersides of coarse rock fragments; disseminated lime; common fine segregated soft masses and seams of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—45 to 60 inches; very pale brown (10YR 8/2) extremely channery loam, light yellowish brown (2.5Y 6/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; few very fine and fine roots; 80 percent channers; disseminated lime; continuous distinct lime casts on undersides of rock fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 38 to 42 degrees F

A horizon
- Value: 4 to 6 dry; 3 or 4 moist
- Chroma: 1 to 3
- Texture: Loam or clay loam
- Clay content: 20 to 35 percent
- Content of rock fragments: 15 to 60 percent—0 to 25 percent stones and cobbles; 15 to 35 percent pebbles or channers
- Reaction: pH 6.6 to 7.8

Bw horizon
- Value: 5 or 6 dry; 4 or 5 moist
- Chroma: 2 to 4
- Texture: Clay loam or loam
- Clay content: 20 to 35 percent
- Content of rock fragments: 15 to 60 percent—10 to 25 percent stones and cobbles; 5 to 35 percent pebbles or channers
- Reaction: pH 6.6 to 7.8

Bk horizons
- Hue: 10YR or 2.5Y
- Value: 6 to 8 dry; 4 to 7 moist
- Chroma: 2 to 4
- Texture: Clay loam or loam
- Clay content: 20 to 35 percent
- Content of rock fragments: 35 to 85 percent—0 to 40 percent stones and cobbles; 25 to 45 percent pebbles or channers
- Calcium carbonate equivalent: 40 to 50 percent
- Reaction: pH 7.4 to 9.0

77F—Whitore-Tropal very channery loams, 25 to 60 percent slopes

Setting

Landform:
- Whitore—Mountains
- Tropal—Mountains

Position on landform:
- Whitore—Backslopes and footslopes
- Tropal—Backslopes and shoulders

Slope:
- Whitore—25 to 60 percent
- Tropal—26 to 60 percent

Elevation: 5,000 to 7,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Whitore and similar soils: 75 percent
Tropal and similar soils: 20 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Very shallow soils: 0 to 1 percent
Moderately deep soils: 0 to 1 percent
Soils that are noncalcareous to 15 inches: 0 to 1 percent

Major Component Description

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

Tropal
Surface layer texture: Very channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Forestland
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.

Management

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

185E—Whitore-Helmville channery loams, 15 to 35 percent slopes

Setting

Landform:
- Whitore—Mountains
- Helmville—Mountains

Slope:
- Whitore—15 to 35 percent
- Helmville—15 to 35 percent

Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 19 to 25 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Whitore and similar soils: 60 percent
Helmville and similar soils: 35 percent

Minor Components
Soils that have slopes more than 35 percent: 0 to 2 percent
Moderately deep soils: 0 to 2 percent
Soils that are deep to bedrock: 0 to 1 percent

Major Component Description

Whitore
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.3 inches

Helmville
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

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

Management

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

185F—Whitore-Helmville channery loams, 35 to 60 percent slopes

Setting

Landform:
- Whitore—Mountains
- Helmville—Mountains

Slope:
- Whitore—35 to 60 percent
- Helmville—35 to 60 percent

Elevation: 5,000 to 6,500 feet
Mean annual precipitation: 19 to 25 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Whitore and similar soils: 70 percent
Helmville and similar soils: 25 percent

Minor Components
Soils that have slopes more than 60 percent: 0 to 2 percent
Moderately deep soils: 0 to 2 percent
Soils that are deep to bedrock: 0 to 1 percent

Major Component Description

Whitore
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.3 inches

Helmville
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.6 inches

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

Management

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

785F—Whitore, dry-Tropal complex, 25 to 45 percent slopes

Setting

Landform:
- Whitore—Mountains
- Tropal—Mountains

Position on landform:
- Whitore—Backslopes and footslopes
- Tropal—Backslopes and shoulders

Slope:
- Whitore—25 to 45 percent
- Tropal—25 to 45 percent

Elevation: 5,000 to 6,000 feet
Mean annual precipitation: 19 to 25 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Whitore and similar soils: 70 percent
Tropal and similar soils: 20 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Very shallow soils: 0 to 2 percent
Very deep loam textured soils: 0 to 2 percent
Moderately deep soils: 0 to 2 percent
Soils with cobbly loam surface layers: 0 to 2 percent

Major Component Description

Whitore
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 5.2 inches

Tropal
Surface layer texture: Very gravelly loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Forestland
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.

Management

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

Windham Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Hills and mountains
Parent material: Alluvium and colluvium derived from limestone
Slope range: 4 to 45 percent
Elevation range: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Loamy-skeletal, carbonatic, frigid Typic Calciustolls

Typical Pedon

Windham channery loam, 4 to 15 percent slopes, in an area of rangeland, 1,900 feet south and 1,600 feet east of the northwest corner of sec. 19, T. 12 N., R. 5 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) channery loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky parting to moderate very fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine roots; 20 percent channers; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bk1—7 to 30 inches; light gray (2.5Y 7/2) very channery loam, light yellowish brown (2.5Y 6/4) moist; weak fine and medium subangular blocky structure; hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 50 percent channers; disseminated lime; many prominent lime crusts on undersides of rock fragments; violently effervescent; strongly alkaline; gradual smooth boundary.

Bk2—30 to 60 inches; light brownish gray (2.5Y 6/2) extremely channery loam, light olive brown (2.5Y 5/4) moist; weak fine subangular blocky structure; hard, friable, moderately sticky, slightly plastic; few very fine roots in upper part; common very

fine interstitial pores; 10 percent flagstones and 55 percent channers; disseminated lime; many prominent lime crusts on undersides of rock fragments; violently effervescent; strongly alkaline.

Range in Characteristics

Soil temperature: 41 to 46 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the calcic horizon: 5 to 10 inches

A horizon
Hue: 7.5YR or 10YR
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 1 to 3
Clay content: 18 to 27 percent
Content of rock fragments: 15 to 35 percent—5 to 15 percent flagstones; 10 to 20 percent pebbles or channers
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 7.4 to 8.4

Bk1 horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 4 to 7 dry; 3 to 6 moist
Chroma: 2 to 4
Texture: Loam or clay loam
Clay content: 18 to 35 percent
Content of rock fragments: 10 to 75 percent—0 to 20 percent cobbles; 10 to 55 percent pebbles
Calcium carbonate equivalent: 35 to 60 percent
Reaction: pH 7.9 to 8.4

Bk2 horizon
Hue: 7.5YR, 10YR, or 2.5Y
Value: 5 to 8 dry; 4 to 7 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or sandy loam
Clay content: 18 to 35 percent
Content of rock fragments: 35 to 75 percent—0 to 20 percent cobbles; 35 to 55 percent pebbles
Calcium carbonate equivalent: 40 to 60 percent
Reaction: pH 7.9 to 8.4

64D—Windham channery loam, 4 to 15 percent slopes

Setting

Landform: Hills
Slope: 4 to 15 percent
Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Windham and similar soils: 95 percent

Minor Components
Very deep loam soils: 0 to 3 percent
Soils with cobbly loam surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Channery 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 4.4 inches

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

Management

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

164E—Windham-Lap channery loams, 8 to 45 percent slopes

Setting

Landform:
- Windham—Hills
- Lap—Hills

Position on landform:
- Windham—Backslopes and footslopes
- Lap—Backslopes and shoulders

Slope:
- Windham—8 to 45 percent
- Lap—8 to 45 percent

Elevation: 4,000 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Windham and similar soils: 75 percent
Lap and similar soils: 20 percent

Minor Components
Whitecow and similar soils: 0 to 1 percent
Areas of rock outcrop: 0 to 1 percent
Very shallow soils: 0 to 1 percent
Moderately deep soils: 0 to 1 percent
Deep loamy soils: 0 to 1 percent

Major Component Description

Windham
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

Lap
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Rangeland
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.

Management

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

664E—Windham-Whitecow-Lap channery loams, 15 to 45 percent slopes

Setting

Landform:
- Windham—Mountains
- Whitecow—Mountains
- Lap—Mountains

Position on landform:
- Windham—Footslopes
- Whitecow—Backslopes and footslopes
- Lap—Shoulders

Slope:
- Windham—15 to 45 percent, south aspect
- Whitecow—15 to 45 percent, north aspect
- Lap—15 to 45 percent

Elevation: 4,000 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Windham and similar soils: 45 percent
Whitecow and similar soils: 35 percent
Lap and similar soils: 15 percent

Minor Components
Soils that have slopes more than 45 percent: 0 to 2 percent
Very shallow soils: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Windham
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

Whitecow
Surface layer texture: Channery loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Limestone colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.9 inches

Lap
Surface layer texture: Channery loam
Depth class: Shallow (10 to 20 inches)
Drainage class: Well drained
Dominant parent material: Limestone residuum
Native plant cover type: Rangeland
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.

Management

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

Winspect Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Moraines and dissected stream terraces
Parent material: Alpine till
Slope range: 2 to 45 percent
Elevation range: 3,800 to 5,500 feet
Mean annual precipitation: 12 to 19 inches
Frost-free period: 90 to 120 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Calciustolls

Typical Pedon

Winspect stony loam, in an area of Beanlake-Winspect stony loams, 4 to 25 percent slopes, in an area of rangeland, 20 feet south and 300 feet east of the northwest corner of sec. 6, T. 20 N., R. 7 W.

A—0 to 5 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine roots; 5 percent stones and 15 percent pebbles; strongly effervescent; slightly alkaline; clear smooth boundary.

Bk1—5 to 11 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; slightly hard, very friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent cobbles and 20 percent pebbles; disseminated lime; many prominent lime casts on undersides of rock fragments; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—11 to 42 inches; very pale brown (10YR 7/3) very cobbly loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 25 percent cobbles and 30 percent pebbles; many prominent lime casts on undersides of rock fragments; disseminated lime; many fine and medium seams and soft masses of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bky—42 to 60 inches; very pale brown (10YR 7/3) very cobbly loam, brown (10YR 5/3) moist; moderate thin platy structure; slightly hard, friable, moderately sticky, slightly plastic; few very fine roots; common very fine tubular and interstitial pores; 25 percent cobbles and 35 percent pebbles; many fine seams and soft masses of lime; common fine seams and soft masses of gypsum; violently effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 41 to 47 degrees F

A horizon
- Value: 4 or 5 dry; 2 or 3 moist
- Chroma: 1 or 2
- Clay content: 20 to 25 percent
- Content of rock fragments: 15 to 35 percent—0 to 5 percent stones; 5 to 15 percent cobbles; 10 to 15 percent pebbles
- Calcium carbonate equivalent: 5 to 10 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 or 3
- Texture: Loam, clay loam, or sandy clay loam
- Clay content: 20 to 35 percent
- Content of rock fragments: 25 to 60 percent—0 to 5 percent stones; 5 to 25 percent cobbles; 20 to 35 percent pebbles
- Calcium carbonate equivalent: 15 to 40 percent
- Reaction: pH 7.9 to 8.4

Bk2 horizon
- Hue: 10YR or 2.5Y
- Value: 5 to 7 dry; 4 to 6 moist
- Chroma: 2 or 3
- Texture: Loam, clay loam, or sandy clay loam
- Clay content: 20 to 35 percent
- Content of rock fragments: 35 to 60 percent—10 to 25 percent cobbles; 25 to 35 percent pebbles
- Calcium carbonate equivalent: 15 to 40 percent
- Reaction: pH 7.9 to 8.4

Bky horizon
- Hue: 10YR or 2.5Y
- Value: 5 to 7 dry; 4 to 6 moist
- Chroma: 2 or 3
- Texture: Loam, clay loam, or sandy clay loam
- Clay content: 20 to 35 percent
- Content of rock fragments: 35 to 60 percent—10 to 25 percent cobbles; 25 to 35 percent pebbles
- Calcium carbonate equivalent: 15 to 40 percent
- Reaction: pH 7.9 to 8.4

443E—Winspect-Cabba-Wayden complex, 8 to 35 percent slopes

Setting

Landform:
- Winspect—Moraines
- Cabba—Hills
- Wayden—Hills

Slope:
- Winspect—8 to 35 percent
- Cabba—8 to 35 percent
- Wayden—8 to 35 percent

Elevation: 4,200 to 5,000 feet

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

Composition

Major Components
Winspect and similar soils: 50 percent
Cabba and similar soils: 30 percent
Wayden and similar soils: 15 percent

Minor Components
Areas of rock outcrop: 0 to 2 percent
Moderately deep loamy soils: 0 to 2 percent
Soils shallow to hard bedrock: 0 to 1 percent

Major Component Description

Winspect
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.1 inches

Cabba
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 3.0 inches

Wayden
Surface layer texture: 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.

Management

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

833E—Winspect, dry-Cabbart complex, 15 to 45 percent slopes

Setting

Landform:
- Winspect—Moraines
- Cabbart—Hills

Slope:
- Winspect—15 to 45 percent
- Cabbart—15 to 45 percent

Elevation: 3,800 to 4,300 feet
Mean annual precipitation: 12 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Winspect and similar soils: 65 percent
Cabbart and similar soils: 20 percent

Minor Components
Delpoint and similar soils: 0 to 5 percent
Beanlake, dry soils: 0 to 5 percent
Soils that are clayey: 0 to 5 percent

Major Component Description

Winspect
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 6.1 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 2.5 inches

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

Management

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

Woodgulch Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Rapid
Landform: Mountains
Parent material: Material derived from coarse-grained granitic rock
Slope range: 8 to 35 percent
Elevation range: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Mixed, frigid Lamellic Ustipsamments

Typical Pedon

Woodgulch stony loamy sand, in an area of Woodgulch-Elbeth-Rock outcrop complex, 8 to 35 percent slopes, in an area of forestland, 1,200 feet north and 1,700 feet east of the southwest corner of sec. 12, T. 9 N., R. 5 W.

Oi—1 inch to 0; forest litter of needles and twigs; abrupt smooth boundary.
A—0 to 4 inches; grayish brown (10YR 5/2) stony loamy sand, very dark grayish brown (10YR 3/2) moist; weak thin platy structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine and fine and few medium and coarse roots; many clear sand grains; 5 percent stones, 5 percent cobbles; and 5 percent pebbles; moderately acid; clear smooth boundary.
E—4 to 13 inches; light brownish gray (10YR 6/2) loamy sand, dark grayish brown (10YR 4/2) moist; weak medium prismatic parting to weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; common very fine and fine and few medium and coarse roots; many very fine tubular and interstitial pores; many clear sand grains coats on faces of peds; slightly acid; gradual smooth boundary.
E/Bt—13 to 30 inches; 85 percent pale brown (10YR 6/3) loamy sand, dark brown (10YR 4/3) moist (E part); 15 percent) pale brown (10YR 6/3) sandy loam, dark brown (10YR 3/3) moist (B part); weak fine and medium subangular blocky structure; hard, friable, slightly sticky, nonplastic; common very fine and fine and few medium and coarse roots; many very fine tubular and interstitial pores; few faint clay films on faces of peds and bridging sand grains; many bleached sand grains on faces of peds; slightly acid; gradual smooth boundary.
E and Bt—30 to 50 inches; 95 percent pale brown (10YR 6/3) loamy sand, dark brown (10YR 4/3) moist (E part); 5 percent brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) moist (B part); weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, nonplastic; few very fine and fine roots; many very fine tubular and interstitial pores; many clear sand grains; lamellae are 1/8- to 1/4-inch thick and total 1-inch thickness and texture to a sandy clay loam; 5 percent pebbles; slightly acid; gradual smooth boundary.
C—50 to 60 inches; light brownish gray (2.5Y 6/2) coarse sand, grayish brown (2.5Y 5/2) moist; single grain; loose; 10 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 42 to 47 degrees F

A horizon
Value: 4 or 5 dry; 3 moist
Chroma: 1 or 2
Clay content: 5 to 10 percent
Content of rock fragments: 5 to 35 percent—0 to 10 percent stones; 0 to 10 cobbles; 5 to 15 percent pebbles
Reaction: pH 5.6 to 6.5

E horizon
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Sand or loamy sand
Clay content: 5 to 10 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.1 to 7.3

E/Bt horizon
Value: E part—6 or 7 dry; 2 to 4 moist; B part—5 or 6 dry; 3 or 4 moist
Chroma: 3 or 4
Clay content: 5 to 10 percent
Content of rock fragments: 0 to 5 percent pebbles
Reaction: pH 6.1 to 7.3

E and Bt horizon
Value: E part—6 or 7 dry; 2 to 4 moist; B part—5 or 6 dry; 3 or 4 moist
Chroma: 3 or 4
Lamellae: Combined thickness of 1/4 to 3 inches
Clay content: 5 to 10 percent
Content of rock fragments: 0 to 5 percent
Reaction: pH 6.1 to 7.3

C horizon
Hue: 10YR or 2.5Y
Value: 6 or 7 dry; 4 or 5 moist
Chroma: 1 or 2
Texture: Coarse sand or loamy sand
Clay content: 0 to 5 percent
Content of rock fragments: 5 to 30 percent pebbles
Reaction: pH 6.1 to 7.3

286E—Woodgulch-Elbeth-Rock outcrop complex, 8 to 35 percent slopes

Setting

Landform:
- Woodgulch—Mountains
- Elbeth—Mountains

Position on landform:
- Woodgulch—Backslopes
- Elbeth—Footslopes
- Rock outcrop—Shoulders

Slope:
- Woodgulch—8 to 35 percent
- Elbeth—8 to 35 percent

Elevation: 4,500 to 5,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Woodgulch and similar soils: 45 percent
Elbeth and similar soils: 30 percent
Rock outcrop: 15 percent

Minor Components
Soils shallow to bedrock: 0 to 4 percent
Soils that have slopes more than 35 percent: 0 to 3 percent
Very deep sandy loam soils: 0 to 3 percent

Major Component Description

Woodgulch
Surface layer texture: Stony loamy sand
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Granitic colluvium
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 3.9 inches

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

Rock outcrop
Definition: Coarse-grained granite bedrock

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

Management

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

Work Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Alluvial fans, stream terraces, and hills
Parent material: Alluvium
Slope range: 0 to 30 percent
Elevation range: 3,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Taxonomic Class: Fine, smectitic, frigid Typic Argiustolls

Typical Pedon

Work clay loam, in an area of Work-Farnuf complex, 2 to 10 percent slopes, in an area of rangeland, 1,700 feet north and 1,300 feet west of the southeast corner of sec. 7, T. 19 N., R. 6 W.

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

Bt1—4 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong fine prismatic parting to strong fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; many very fine roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds; slightly alkaline; gradual smooth boundary.

Bt2—8 to 14 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; strong fine and medium

prismatic parting to strong fine subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; continuous prominent very dark grayish brown (10YR 3/2) moist clay films on faces of peds; slightly alkaline; gradual smooth boundary.

Btk—14 to 25 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; moderate medium prismatic structure; hard, firm, moderately sticky, moderately plastic; common very fine roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; common fine and medium soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bk—25 to 60 inches; light gray (2.5Y 7/2) clay loam, olive gray (5Y 5/2) moist; weak medium prismatic parting to weak medium and coarse angular blocky structure; hard, friable, moderately sticky, moderately plastic; few very fine roots; many very fine tubular and interstitial pores; common fine and medium seams and soft masses of lime; strongly effervescent; moderately alkaline; gradual smooth boundary.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Thickness of the mollic epipedon: 7 to 16 inches
Depth to the Bk horizon: 14 to 30 inches
Soil phases: Stony

A horizon
Value: 4 or 5 dry; 2 or 3 moist
Chroma: 2 or 3
Texture: Loam (clay loam when mixed to 7 inches)
Clay content: 20 to 40 percent
Content of rock fragments: 0 to 35 percent—0 to 15 percent stones and cobbles; 0 to 20 percent pebbles
Reaction: pH 6.1 to 7.8

Bt horizons
Value: 4 or 5 dry; 2 to 4 moist
Chroma: 2 or 3
Texture: Clay loam, clay, or silty clay
Clay content: 35 to 50 percent with more than 15 percent fine sand and coarser
Content of rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles; 0 to 10 percent pebbles
Reaction: pH 6.6 to 7.8

Btk horizon
Hue: 10YR or 2.5Y
Value: 5 or 6 dry; 4 or 5 moist
Chroma: 2 or 3
Texture: Clay or clay loam
Clay content: 20 to 40 percent
Content of rock fragments: 0 to 15 percent—0 to 5 percent stones and cobbles; 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

Bk horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loam or clay loam
Clay content: 15 to 40 percent
Content of rock fragments: 0 to 35 percent—0 to 5 percent cobbles; 0 to 30 percent pebbles
Calcium carbonate equivalent: 5 to 15 percent
Reaction: pH 7.4 to 8.4

544A—Work-Farnuf complex, 0 to 2 percent slopes

Setting

Landform:
- Work—Stream terraces
- Farnuf—Stream terraces

Slope:
- Work—0 to 2 percent
- Farnuf—0 to 2 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Work and similar soils: 60 percent
Farnuf and similar soils: 35 percent

Minor Components
Soils that have slopes more than 2 percent: 0 to 2 percent
Moderately sodic soils: 0 to 2 percent
Soils with very gravelly substratums: 0 to 1 percent

Major Component Description

Work
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)

Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 10.1 inches

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

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

Management

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

544C—Work-Farnuf complex, 2 to 10 percent slopes

Setting

Landform:
- Work—Alluvial fans
- Farnuf—Alluvial fans

Slope:
- Work—2 to 10 percent
- Farnuf—2 to 10 percent

Elevation: 4,200 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Work and similar soils: 50 percent
Farnuf and similar soils: 40 percent

Minor Components
Hilger and similar soils: 0 to 5 percent
Regent and similar soils: 0 to 5 percent

Major Component Description

Work
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 8.2 inches

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

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

Management

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

644C—Work stony loam, 2 to 15 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 15 percent
Elevation: 3,500 to 5,000 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Work and similar soils: 95 percent

Minor Components
Regent and similar soils: 0 to 2 percent
Hilger and similar soils: 0 to 1 percent
Farnuf and similar soils: 0 to 1 percent
Soils with silty clay subsoil: 0 to 1 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 7.6 inches

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

Management

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

744C—Work cobbly clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Work and similar soils: 95 percent

Minor Components
Farnuf and similar soils: 0 to 2 percent
Soils with stony clay loam surface layers: 0 to 1 percent
Soils with clay loam surface layers: 0 to 1 percent
Soils with very gravelly substratums: 0 to 1 percent

Major Component Description

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

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

Management

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

844C—Work clay loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 15 to 19 inches
Frost-free period: 90 to 110 days

Composition

Major Components
Work and similar soils: 90 percent

Minor Components
Farnuf and similar soils: 0 to 3 percent
Soils with very gravelly substratums: 0 to 3 percent
Slightly sodic soils: 0 to 2 percent
Soils with lighter colored surface layers: 0 to 2 percent

Major Component Description

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

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

Management

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

Worock Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Mountains
Parent material: Alpine till
Slope range: 8 to 60 percent
Elevation range: 4,600 to 6,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Taxonomic Class: Loamy-skeletal, mixed, superactive Eutric Haplocryalfs

Typical Pedon

Worock stony loam, 8 to 35 percent slopes, in an area of forestland, 2,400 feet north and 2,100 feet east of the southwest corner, of sec. 9, T. 14 N., R. 9 W.

Oi—3 inches to 0; forest litter of slightly decomposed needles, twigs, and roots.
E1—0 to 5 inches; light gray (10YR 7/2) stony loam, grayish brown (10YR 5/2) moist; moderate thin platy structure; soft, very friable, slightly sticky,

slightly plastic; many very fine and fine and common medium roots; many very fine tubular and interstitial pores; 5 percent stones, 5 percent cobbles, and 20 percent pebbles; neutral; gradual smooth boundary.

E2—5 to 9 inches; light gray (10YR 7/2) gravelly loam, grayish brown (10YR 5/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine and fine roots; many very fine tubular and interstitial pores; 5 percent cobbles and 20 percent pebbles; neutral; clear smooth boundary.

Bt1—9 to 18 inches; light yellowish brown (10YR 6/4) very cobbly clay loam, dark yellowish brown (10YR 4/4) moist; strong fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; continuous distinct dark brown (10YR 4/3) moist clay films on faces of peds; 20 percent cobbles and 20 percent pebbles; neutral; gradual smooth boundary.

Bt2—18 to 30 inches; brownish yellow (10YR 6/6) very cobbly clay loam, yellowish brown (10YR 5/6) moist; moderate medium and coarse subangular blocky structure; hard, firm, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; many distinct yellowish brown (10YR 5/4) moist clay films on faces of peds; common very dark grayish brown (10YR 3/2) moist organic stains in root channels; 20 percent cobbles and 20 percent pebbles; neutral; gradual smooth boundary.

Bt3—30 to 60 inches; brownish yellow (10YR 6/6) very cobbly clay loam, dark yellowish brown (10YR 4/6) moist; moderate fine and medium subangular blocky structure; hard, firm, moderately sticky, moderately plastic; few very fine, fine, and medium roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; 30 percent cobbles and 20 percent pebbles; neutral.

Range in Characteristics

Soil temperature: 37 to 45 degrees F
Depth to the argillic horizon: 6 to 20 inches

E horizons
Value: 6 or 7 dry; 3 to 5 moist
Chroma: 2 to 4
Clay content: 18 to 27 percent
Content of rock fragments: 15 to 35 percent—5 to 15 percent stones and cobbles; 10 to 20 percent pebbles
Reaction: pH 5.1 to 6.5

Bt horizons
Hue: 10YR or 7.5YR
Value: 5 to 7 dry; 4 or 5 moist
Chroma: 4 or 6
Texture: Loam, clay loam, or sandy clay loam
Clay content: 25 to 35 percent
Content of rock fragments: 35 to 65 percent—0 to 10 percent stones; 5 to 15 percent cobbles; 25 to 45 percent pebbles
Reaction: pH 5.6 to 6.5

15E—Worock-Mikesell stony loams, 8 to 35 percent slopes

Setting

Landform:
- Worock—Mountains
- Mikesell—Mountains

Slope:
- Worock—8 to 35 percent
- Mikesell—8 to 35 percent

Elevation: 4,600 to 6,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Worock and similar soils: 55 percent
Mikesell and similar soils: 40 percent

Minor Components
Very deep loam soils: 0 to 1 percent
Soils that have slopes more than 35 percent: 0 to 1 percent
Soils with cobbly loam surface layers: 0 to 1 percent
Soils that are poorly drained and ponded: 0 to 1 percent
Soils with gravelly loam surface layers: 0 to 1 percent

Major Component Description

Worock
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

Mikesell
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 8.6 inches

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

Management

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

19E—Worock stony loam, 8 to 35 percent slopes

Setting

Landform: Mountains
Slope: 8 to 35 percent
Elevation: 4,600 to 6,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Worock and similar soils: 95 percent

Minor Components
Mikesell and similar soils: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 1 percent
Soils with less rock fragments: 0 to 1 percent
Soils that are poorly drained and ponded: 0 to 1 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

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

Management

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

19F—Worock stony loam, 35 to 60 percent slopes

Setting

Landform: Mountains
Slope: 35 to 60 percent
Elevation: 4,600 to 6,000 feet
Mean annual precipitation: 20 to 30 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Worock and similar soils: 95 percent

Minor Components
Mikesell and similar soils: 0 to 2 percent
Soils that have slopes more than 60 percent: 0 to 1 percent
Soils with less rock fragments: 0 to 1 percent
Soils that are poorly drained and ponded: 0 to 1 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

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

Management

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

119E—Worock stony loam, warm, 8 to 35 percent slopes

Setting

Landform: Mountains
Slope: 8 to 35 percent
Elevation: 4,600 to 5,500 feet

Mean annual precipitation: 20 to 25 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Worock and similar soils: 90 percent

Minor Components
Libeg and similar soils: 0 to 4 percent
Soils that have slopes more than 35 percent: 0 to 3 percent
Soils with less rock fragments: 0 to 3 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

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

Management

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

219E—Worock, warm-Libeg stony loams, 8 to 35 percent slopes

Setting

Landform:
- Worock—Mountains
- Libeg—Mountains

Position on landform:
- Worock—Backslopes
- Libeg—Backslopes and footslopes

Slope:
- Worock—8 to 35 percent
- Libeg—8 to 35 percent, south aspect

Elevation: 4,600 to 5,500 feet
Mean annual precipitation: 20 to 25 inches
Frost-free period: 50 to 70 days

Composition

Major Components
Worock and similar soils: 60 percent
Libeg and similar soils: 35 percent

Minor Components
Leavitt and similar soils: 0 to 2 percent
Soils that have slopes more than 35 percent: 0 to 2 percent
Moderately deep soils: 0 to 1 percent

Major Component Description

Worock
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
Flooding: None
Available water capacity: Mainly 4.9 inches

Libeg
Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 4.4 inches

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

Management

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

Yamacall Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderate
Landform: Alluvial fans, stream terraces, and uplands
Parent material: Alluvium
Slope range: 0 to 8 percent
Elevation range: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Taxonomic Class: Fine-loamy, mixed, superactive, frigid Aridic Haplustepts

Typical Pedon

Yamacall silt loam, 2 to 8 percent slopes, in an area of cropland, 600 feet north and 1,800 feet west of the southeast corner of sec. 9, T. 20 N., R. 5 W.

Ap—0 to 5 inches; light brownish gray (10YR 6/2) silt loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, moderately sticky, slightly plastic; many very fine roots; strongly effervescent; moderately alkaline; abrupt smooth boundary.

Bw—5 to 12 inches; light gray (10YR 7/2) silt loam, brown (10YR 5/3) moist; moderate medium prismatic parting to moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; few fine irregular soft masses and seams; violently effervescent; moderately alkaline; clear smooth boundary.

Bk1—12 to 31 inches; light gray (10YR 7/2) loam, brown (10YR 5/3) moist; weak medium prismatic parting to weak medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine roots; many very fine tubular and interstitial pores; disseminated lime; common fine irregular soft masses and seams of lime; violently effervescent; moderately alkaline; gradual smooth boundary.

Bk2—31 to 60 inches; light brownish gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, very friable, slightly sticky, slightly plastic; few very fine roots; disseminated lime; few fine soft masses; strongly effervescent; moderately alkaline.

Range in Characteristics

Soil temperature: 42 to 47 degrees F
Depth to the Bk horizon: 10 to 20 inches

Ap horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 or 6 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 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 6.6 to 8.4

Bw horizon
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 7 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or silt loam
Clay content: 18 to 30 percent with 15 to 35 percent fine sand and coarser
Content of rock fragments: 0 to 15 percent—0 to 5 percent cobbles; 0 to 10 percent pebbles
Calcium carbonate equivalent: 5 to 10 percent
Reaction: pH 6.6 to 8.4

Bk horizons
Hue: 10YR, 2.5Y, or 5Y
Value: 5 to 8 dry; 4 to 6 moist
Chroma: 2 to 4
Texture: Loam, clay loam, or silt loam
Clay content: 18 to 30 percent with 15 to 35 percent fine sand and coarser
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
Reaction: pH 7.9 to 9.0

24A—Yamacall silt loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Slope: 0 to 2 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Yamacall and similar soils: 90 percent

Minor Components
Soils that have slopes more than 2 percent: 0 to 3 percent
Attewan and similar soils: 0 to 3 percent
Soils with loam surface layers: 0 to 2 percent
Soils with darker colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

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

Management

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

24C—Yamacall silt loam, 2 to 8 percent slopes

Setting

Landform: Alluvial fans
Slope: 2 to 8 percent
Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Yamacall and similar soils: 90 percent

Minor Components
Soils that have slopes more than 8 percent: 0 to 3 percent
Attewan and similar soils: 0 to 3 percent
Soils with loam surface layers: 0 to 2 percent
Soils with darker colored surface layers: 0 to 2 percent

Major Component Description

Surface layer texture: Silt loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

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

Management

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

116B—Yamacall-Gerdrum complex, 0 to 4 percent slopes

Setting

Landform:
- Yamacall—Alluvial fans
- Gerdrum—Alluvial fans

Position on landform:
- Yamacall—Microhighs
- Gerdrum—Microlows

Slope:
- Yamacall—0 to 4 percent
- Gerdrum—0 to 4 percent

Elevation: 3,500 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Yamacall and similar soils: 65 percent
Gerdrum and similar soils: 25 percent

Minor Components
Delpoint and similar soils: 0 to 3 percent
Soils that have slopes more than 4 percent: 0 to 2 percent
Soils with strongly saline surface layers: 0 to 2 percent
Soils with darker colored surface layers: 0 to 2 percent
Soils with loam surface layers: 0 to 1 percent

Major Component Description

Yamacall
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 9.7 inches

Gerdrum
Surface layer texture: Clay loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Salt affected: Saline within 30 inches
Sodium affected: Sodic within 30 inches
Available water capacity: Mainly 6.0 inches

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

Management

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

569A—Yamacall-Attewan loams, 0 to 2 percent slopes

Setting

Landform:
- Yamacall—Stream terraces
- Attewan—Stream terraces

Slope:
- Yamacall—0 to 2 percent
- Attewan—0 to 2 percent

Elevation: 3,600 to 4,500 feet
Mean annual precipitation: 10 to 14 inches
Frost-free period: 105 to 120 days

Composition

Major Components
Yamacall and similar soils: 50 percent
Attewan and similar soils: 45 percent

Minor Components
Soils that have slopes more than 2 percent: 0 to 2 percent
Soils with shallow to sand and gravel: 0 to 2 percent
Very deep silt loam soils: 0 to 1 percent

Major Component Description

Yamacall
Surface layer texture: Loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Native plant cover type: Rangeland
Flooding: None
Available water capacity: Mainly 9.7 inches

Attewan
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 4.4 inches

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

Management

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

Yourame Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately slow
Landform: Mountains
Parent material: Alpine till
Slope range: 8 to 35 percent
Elevation range: 4,500 to 5,200 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 90 days

Taxonomic Class: Loamy-skeletal, mixed, superactive, frigid Typic Haplustalfs

Typical Pedon

Yourame stony loam, 8 to 35 percent slopes, in an area of forestland, 1,500 feet south and 1,500 feet west of the northeast corner of sec. 15, T. 14 N., R. 8 W.

Oi—2 inches to 0; forest litter of slightly decomposed needles and twigs.

E1—0 to 6 inches; light brownish gray (10YR 6/2) stony loam, very dark grayish brown (10YR 3/2) moist; weak very thin platy parting to moderate very fine and fine granular structure; soft, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; 3 percent stones, 5 percent cobbles, and 15 percent pebbles; neutral; clear smooth boundary.

E2—6 to 15 inches; pinkish gray (7.5YR 6/2) gravelly sandy loam, brown (7.5YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; 5 percent cobbles and 10 percent pebbles; neutral; gradual smooth boundary.

Bt1—15 to 29 inches; light brown (7.5YR 6/4) very cobbly sandy clay loam, dark brown (7.5YR 4/4) moist; strong fine and medium subangular blocky structure; hard, friable, moderately sticky, moderately plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; continuous distinct clay films on faces of peds; 20 percent cobbles and 25 percent pebbles; slightly acid; gradual smooth boundary.

Bt2—29 to 60 inches; pinkish gray (7.5YR 7/2) very cobbly sandy clay loam, brown (7.5YR 5/4) moist;

moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky, slightly plastic; common very fine and fine and few medium roots; many very fine tubular and interstitial pores; common distinct clay films on faces of peds; 20 percent cobbles and 30 percent pebbles; slightly acid.

Range in Characteristics

Soil temperature: 42 to 46 degrees F

E1 horizon
- Value: 6 or 7 dry; 3 to 5 moist
- Chroma: 2 or 3
- Clay content: 7 to 20 percent
- Content of rock fragments: 15 to 35 percent—5 to 15 percent stones and cobbles; 15 to 35 percent pebbles
- Reaction: pH 5.6 to 7.3

E2 horizon
- Value: 6 or 7 dry; 4 to 6 moist
- Chroma: 2 or 3
- Texture: Loam or sandy loam
- Clay content: 7 to 20 percent
- Content of rock fragments: 15 to 35 percent—0 to 10 percent stones and cobbles; 15 to 25 percent pebbles
- Reaction: pH 5.6 to 7.3

Bt horizons
- Hue: 10YR or 7.5YR
- Value: 5 to 7 dry; 4 or 5 moist
- Chroma: 2 to 4
- Texture: Clay loam or sandy clay loam
- Clay content: 20 to 35 percent
- Content of rock fragments: 35 to 60 percent—5 to 20 percent stones and cobbles; 30 to 40 percent pebbles
- Reaction: pH 5.6 to 7.3

784D—Yourame stony loam, 8 to 35 percent slopes

Setting

Landform: Mountains
Slope: 8 to 35 percent
Elevation: 4,500 to 5,200 feet
Mean annual precipitation: 18 to 22 inches
Frost-free period: 70 to 90 days

Composition

Major Components
Yourame and similar soils: 90 percent

Minor Components
Soils with sand and gravel at 30 inches: 0 to 4 percent
Soils that are poorly drained and ponded: 0 to 2 percent
Soils with darker colored surface layers: 0 to 2 percent
Soils with less rock fragments: 0 to 2 percent

Major Component Description

Surface layer texture: Stony loam
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alpine till
Native plant cover type: Forestland
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.

Management

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

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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.

Alkali (sodic) soil. (See Sodic (alkali) soil.)

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 hillslopes.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redox feature.

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.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redox features.

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.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3.75
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.

Backslope. The geomorphic component that forms the steepest inclined surface and principal element of many hillslopes. Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes 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, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular

to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding planes. Fine strata, less than 5-millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-floored plain. An extensive nearly level to gently rolling or moderately sloping area that is underlain by hard bedrock and has a slope of 0 to 8 percent.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of cobbles or gravel. In some blowouts, the water table is exposed.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Bouldery. Refers to a soil with .01 to 0.1 percent of the surface covered with boulders.

Bouldery soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments larger than 24 inches (60 centimeters) in diameter.

Breaks. The steep and 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, felled trees generally are 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 directly beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

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 material. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

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 millimeters in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from the adjacent stands.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 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 has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has 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.

COLE (coefficient of linear extensibility). (See Linear extensibility.)

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forestland 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.

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 or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer-textured 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 effects of 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. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to

compression. Terms describing consistence are defined in the "Soil Survey Manual" (Soil Survey Division Staff, 1962).

Consolidated sandstone. Sandstone that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry, are not easily crushed, and cannot be textured by the usual field method.

Consolidated shale. Shale that disperses within a few hours when fragments are placed in water. The fragments are extremely hard or very hard when dry and are not easily crushed.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

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.

Cropping system. Growing crops according to a planned system of rotation and management practices.

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 the 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 the 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.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

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 to the dip of the underlying bedrock.

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 a full stripcropping pattern to be used.

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 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.

Ecological site. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological 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 ecological sites in kind and/or proportion of species or in total production.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

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.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as 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. Synonym: scarp.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than a mile to more than 100 miles in length and from 10 to 100 feet in height.

Even aged. Refers to a stand of trees in which only small differences in age occur between individual trees. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess salt (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

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 ovendry 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. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters 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 has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has 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 flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.

Footslope. The geomorphic component that forms the inner, gently inclined surface at the base of a hillslope. The surface profile is dominantly concave. In terms of gradational processes, a footslope is a transitional zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

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.

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. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. 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. 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.

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. Soil that is 15 to 35 percent, by volume, rounded or angular rock fragments up to 3 inches (7.6 centimeters) in diameter. Very gravelly soil is 35 to 60 percent gravel, and extremely gravelly soil is more than 60 percent gravel by volume.

Grazeable forestland. Land capable of sustaining livestock grazing by producing forage of sufficient quantity during one or more stages of secondary forest succession.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gypsum. A mineral consisting of hydrous calcium sulfate.

Habitat type. An aggregation of all land areas capable of producing similar climax plant communities.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 8 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual" (Soil Survey Division Staff, 1962). The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A or E horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Sedimentary beds of consolidated sandstone and semiconsolidated and consolidated shale. Generally, roots can penetrate this horizon only along fracture planes.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well-decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and 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.

Krotovina. A filled faunal burrow—Irregular tubular streaks caused by the filling of tunnels made by burrowing animals in one layer with material from outside the layer. In a profile, they appear rounded or elliptical. Their textures and structures may be unlike those of the soil around them.

Lacustrine deposit. 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.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

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. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting

of iron oxide or manganese oxide generally are considered a type of redox concentration.

Mean annual increment (MAI). The average annual increase in volume of a tree during its entire life.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Microhigh. An area that is 2 to 12 inches higher than the adjacent microlow.

Microlow. An area that is 2 to 12 inches lower than the adjacent microhigh.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Miscellaneous water. A sewage lagoon, an industrial waste pit, a fish hatchery, or a similar water area.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately deep soil. A soil that is 20 to 40 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform 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. Areas of color that differ from the matrix color. These colors are commonly attributes retained from the geologic parent material. (See Redox features for indications of poor aeration and impeded drainage.)

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

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.

Naturalized pasture. Forestland that is used primarily for the production of forage for grazing by livestock rather than for the production of wood products. Overstory trees are removed or managed to promote the native and introduced understory vegetation occurring on the site. This vegetation is managed for its forage value through the use of grazing management principles.

Neutral soil. A soil having a pH value of 6.6 to 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. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

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 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 or air to move downward through the profile.

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 to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit. The range of moisture content within which the soil remains 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. Unless the soils are artificially drained, 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.

Potential natural community (PNC). The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development. The PNC may include acclimatized or naturalized nonnative species.

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. (See Similarity index.)

Range site. (See Ecological site.)

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Red beds. Sedimentary strata that are mainly red and are made up largely of sandstone and shale.

Redox concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redox depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redox features. Redox concentrations, redox depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redox feature.

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 generally is 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, boulders, stones, cobbles, and gravel.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts 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 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

Sand. As a soil separate, individual rock or mineral fragments from 0.05 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.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

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 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 transitional zone from the backslope 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.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeters) to the lower limit of very fine sand (0.05 millimeters). 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.

Similarity index. A similarity index is the percentage of a specific vegetation state plant community that is presently on the site.

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.

Slickspot. 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.

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

Sodium adsorption ratio (SAR). A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.

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 material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with tillage, or stones cover .01 to 0.1 percent of the surface. Very stony means that 0.1 to 3.0 percent of the surface is covered with stones. Extremely stony means that 3 to 15 percent of the surface is covered with stones.

Stony soil material. Soil that is 15 to 35 percent, by volume, rock fragments that are dominated by fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

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. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Summit. A general term for the top, or highest level, of an upland feature, such as a hill or mountain. It commonly refers to a higher area that has a gentle slope and is flanked by steeper slopes.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Tailwater. The water directly downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

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 generally is 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.

Terracette. Small, irregular step-like forms on steep hillslopes, especially in pasture, formed by creep or erosion of surficial materials that may or may not be induced by trampling of livestock such as sheep or cattle.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive, nearly level to gently rolling or moderately sloping area that is underlain by or consists of till and that has a slope of 0 to 8 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes 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.

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.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded

glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Very deep soil. A soil that is more than 60 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Very shallow soil. A soil that is less than 10 inches deep over bedrock or to other material that restricts the penetration of plant roots.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water-spreading. Diverting runoff from natural channels by means of a system of dams, dikes, or ditches and spreading it over relatively flat surfaces.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse-grained particles that are well distributed over 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 ovendry 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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