United States
Department of
Agriculture

Soil
Conservation
Service

In Cooperation with
Colorado Agricultural
Experiment Station

Soil Survey of Huerfano County Area Colorado

HOW TO USE

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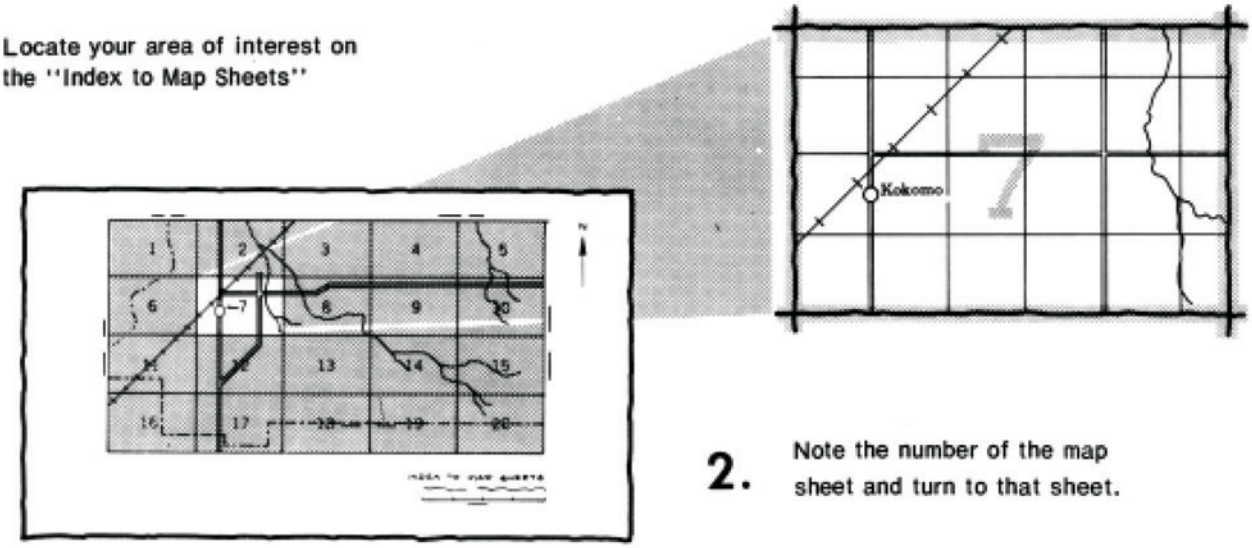

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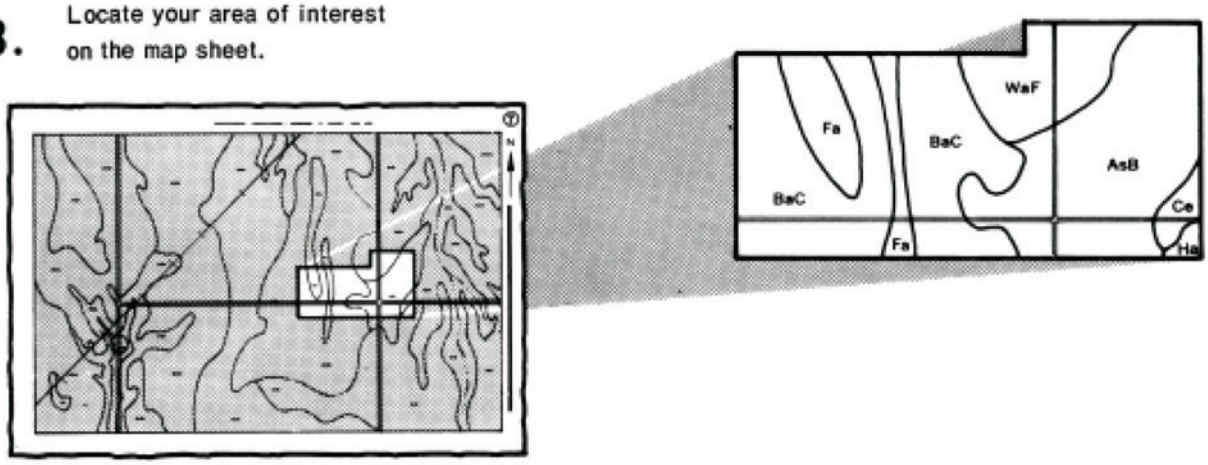

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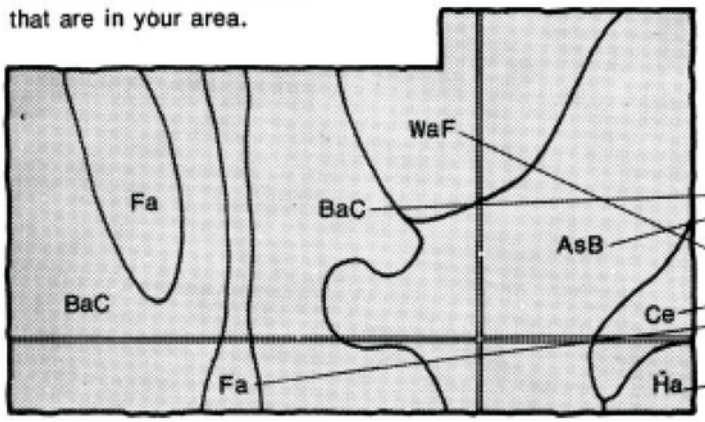

Symbols

AsB
BaC
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THIS SOIL SURVEY

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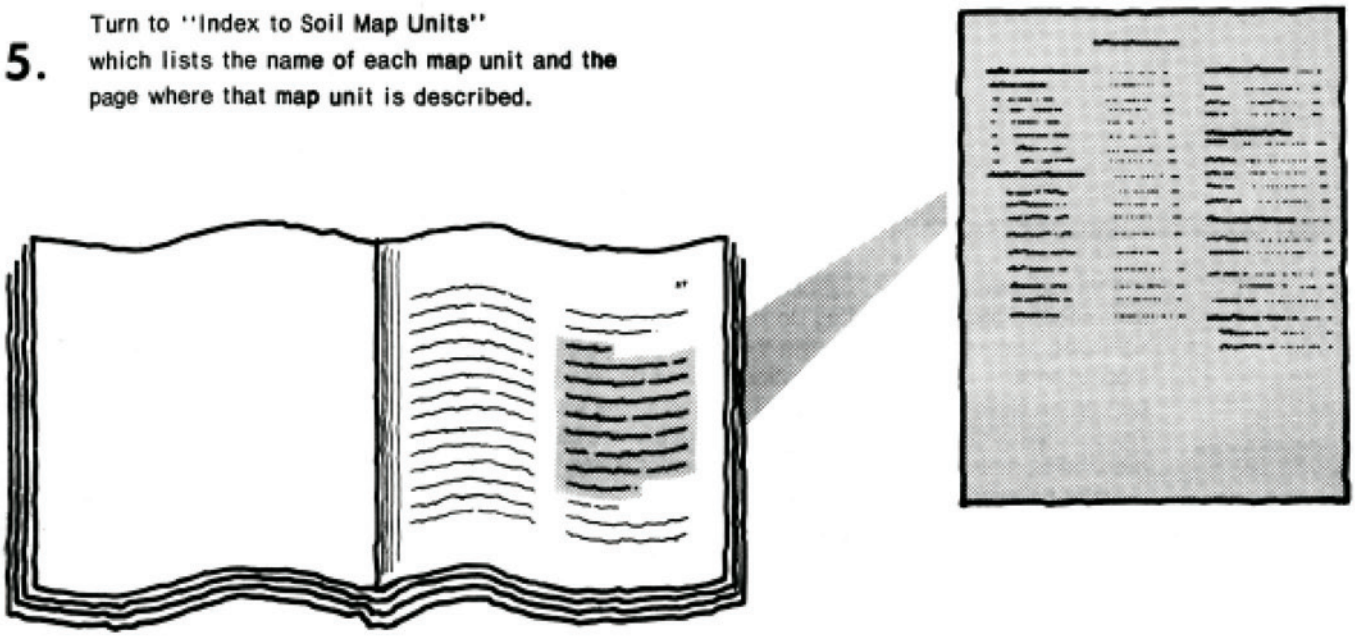
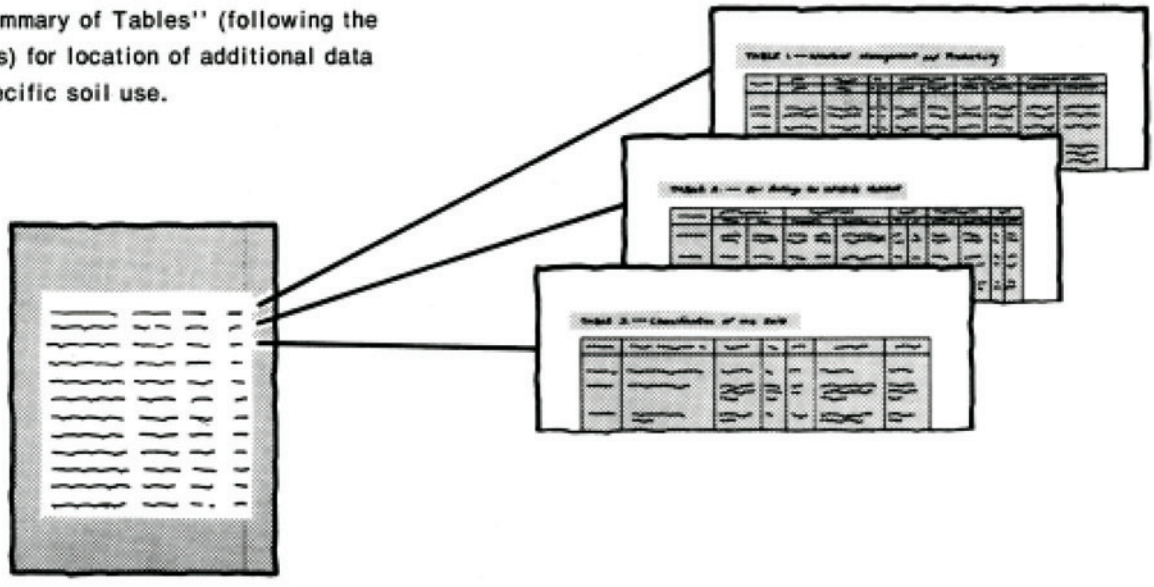


6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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 Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1969-79. Soil names and descriptions were approved in 1980. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979. This survey was made cooperatively by the Soil Conservation Service and the Colorado Agricultural Experiment Station. It is part of the technical assistance furnished to the Upper Huerfano Soil Conservation District.

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

Cover: Wheat-fallow strips on Noden sandy loam, 1 to 8 percent slopes. Strips are perpendicular to the prevailing winds to reduce soil blowing and to conserve moisture..

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foreword

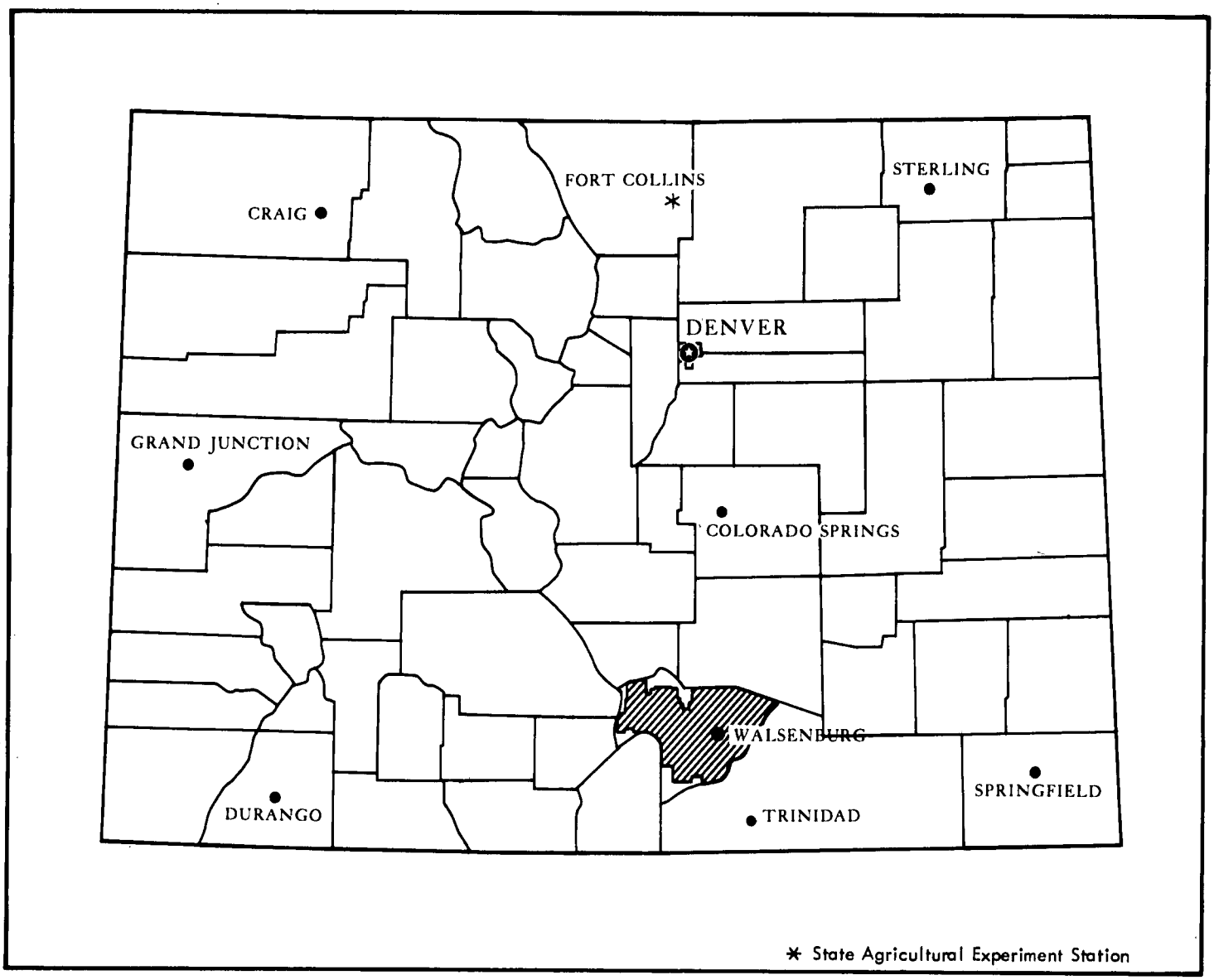
This soil survey contains information that can be used in land-planning programs in Huerfano County Area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the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

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure 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 (*14*).

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

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

Sheldon G. Boone
State Conservationist
Soil Conservation Service



Location of Huerfano County Area in Colorado.

soil survey of
Huerfano County Area, Colorado

By M. Bruce McCullough, David L. Anderson, Mark C. Neeley
John Sampson, Gregory L. Snell, Richard C. Stover, and
Timothy J. Wheeler, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with
Colorado Agricultural Experiment Station

HUERFANO COUNTY AREA includes all of Huerfano County except for the part that is in the San Isabel National Forest. The total area is 873,000 acres. The total population of Huerfano County in 1970 was 6,590, nearly all of which was in the survey area. Walsenburg, the county seat, has a population of 4,329 (*23*).

general nature of the survey area

This section discusses the history and development; physiography, relief, and drainage; natural resources; water supply; agriculture; and climate in the survey area.

history and development

In November 1861, Huerfano County was established from the original boundaries of the St. Vrain and Vigil land grant (*6*). An isolated volcanic cone in the northeastern part of the county was a landmark for early Spanish expeditions and was called the Huerfano, meaning "orphan," Butte, for which the county was named. The county originally encompassed a large area that was divided into Baca, Bent, Huerfano, Las Animas, Otero, and Prowers Counties and part of Pueblo County in 1867 (*15*).

The Ute, Comanche, and Arapahoe Indians inhabited the survey area when the first Spanish explorers passed through it. Jose Fabian Baca and Pedro Martinez were two of the first settlers in the area. They established ranches 2 miles east of Badito on the Huerfano River. In 1862, John Francisco and Henry Daigre established the town presently called La Veta. These early settlers were largely dependent on crop and livestock production (*4*). In 1865, approximately 3,000 acres along the Huerfano and Cucharas Rivers were under cultivation.

August Sporleder, Otto Unfug, and Fred Walsen were early settlers in the (*16*) Plaza de Los Leones area, which later became Walsenburg. The extension of the Denver and Rio Grande Western Railroad in 1876 opened up trade in this area. The Colorado Fuel and Iron Corporation opened the Walsen Coal Mine in 1876, which started an economic boom (*3*). Coal production peaked between 1915 and 1920, when Huerfano County ranked second in coal production statewide. Increased use of oil and gas for energy, however, led to the decline of coal production. In 1918, 37 mines were in production, but by 1970 there were only two active mines.

Beef production is now the principal industry in the survey area. Huerfano was the first county in Colorado to raise registered Hereford cattle.

The first county seat was Autobees Plaza. The county seat was moved to Badito in 1867 when the county was reorganized. Walsenburg, presently the principal city in Huerfano County, was incorporated in 1873, and it became the county seat in 1874. La Veta was incorporated in 1886. Other communities in the county are Cuchara, Farisita, Gardner, Pryor, and Red Wing.

physiography, relief, and drainage

Huerfano County Area is in two physiographic provinces. The western half of the area is in the Southern Rocky Mountain province, and the eastern half is in the Great Plains province. Several distinct physiographic areas are in the parts of these two provinces that are included in the survey area. These

areas are the Culebra Range, the Sangre de Cristo Mountains, the Wet Mountains, the Canyon and Mesa area, the Shale Plains, the Coal Basin, and Huerfano Park. An understanding of these physiographic areas is important to the understanding of the soils in the survey area (*9*).

The southwestern boundary of the area is marked by the Culebra Range. The Sangre de Cristo Mountains and the San Isabel National Forest form the northwestern boundary. The northern boundary is marked by the Wet Mountains and the San Isabel National Forest.

The Canyon and Mesa physiographic area is in the eastern part of the county. This area is mainly underlain by limestone, sandstone, and shale that have been slightly tilted, faulted, and subsequently eroded to form canyons, fault scarps, and buttes. The Cucharas and Huerfano Canyons, Rattlesnake Buttes, and Turkey Ridge are in this area.

Immediately to the west of the Canyon and Mesa area is the Shale Plains physiographic area. This area is characterized by low relief and long, gentle slopes. The low relief, however, is interrupted by dikes, sills, and plugs, such as Huerfano Butte, and by moderately sloping pediments that extend eastward from the Wet Mountains. The area is underlain mainly by shale.

Directly west of the Shale Plains area is a steep, east-facing sandstone escarpment. This escarpment marks the beginning of the Coal Basin physiographic area. This area is bordered on the west by the Culebra Range and on the south by Spanish Peaks and the San Isabel National Forest. The area is underlain by a sequence of sandstone, coal, and shale. It is characterized by numerous igneous dikes, plugs, sills, and stocks. The Goemmer Butte, Mount Mestas, Rough Mountain, Dike Mountain, Little Sheep and Sheep Mountains, Black Hills, and Spanish Peaks are in this area. Many dikes extend from Dike Mountain and Spanish Peaks.

Huerfano Park is the physiographic area that lies immediately to the north of the Coal Basin area. It is between the Sangre de Cristo and Wet Mountains. This area has a badland topography of rolling hills that have an angular, jagged profile as a result of erosion.

The Huerfano River and its tributaries drain most of Huerfano County. A small area along the northern boundary of the county and east of the Wet Mountains is drained by Graneros Creek, which is a tributary of the St. Charles River. Another small area at the eastern tip of the county is drained by Mustang Creek, which empties into the Apishapa River. The Huerfano, St. Charles, and Apishapa Rivers are tributaries of the Arkansas River.

The Cucharas River, the principal tributary of the Huerfano River, drains the southern part of the county, including Spanish Peaks, Culebra Range, and most of Coal Basin. It flows from southwest to northeast. Some of the major tributaries of the Cucharas River are Santa Clara, Bear, and Wahatoya Creeks. The main part of the Huerfano River drains the northern part of the area, which includes Huerfano Park, the Sangre de Cristo Mountains, and the Wet Mountains. The Huerfano River flows from southwest to northeast. The Williams, Turkey, Manzanares, Pass, Oak, and Apache Creeks are some of its smaller tributaries.

natural resources

Soil and water are the most important resources in the survey area. Livestock, native grasses, irrigated hay, nonirrigated winter wheat, and timber are the principal products derived from the soil. Approximately 85 percent of the area is used for grazing, 7 percent for commercial timber, and 4 percent for dryland crops and irrigated hay.

Bituminous coal (noncoking) is the most important mineral in the area. Coal deposits, which contain an estimated 670 million tons of coal, cover 263 square miles of the survey area (*7*). Extensive coal deposits are in the Vermejo and Raton Formations. These deposits are the northern extension of the Raton coalfields.

Other natural resources in the survey area are gold, silver, uranium, copper, iron, lead, fire clay, granite, alum, gypsum, limestone, marble, potters clay, sand, and gravel (*6*). Most of these are present in insufficient quantities to make economic development feasible. In 1970, two underground coal mines, one granite quarry, four sand and gravel pits, and one clay mine were operating in the survey area. Several areas have potential as a source of sand, gravel, and clay.

water supply

The Huerfano and the Cucharas Rivers and their major tributaries are the principal sources of surface water in the survey area. The more important streams that supply irrigation water include Apache, Bear, Muddy, Pass, Santa Clara, Turkey, Wahatoya, Williams, and Yellowstone Creeks. Snowmelt from the Sangre de Cristo Mountains, the Wet Mountains, and the Culebra Range and some water from springs and seeps in the highlands flow into these streams.

A number of reservoirs have been developed to store water from the Cucharas River and some of its tributaries. Martin and Horseshoe Lakes supply some municipal and irrigation water and are important for recreation in the Lathrop State Park. Cucharas Reservoir, the largest reservoir in the survey area, supplies water for irrigation.

The principal sources of ground water are several sandstone and limestone aquifers of Cretaceous age and unconsolidated alluvium aquifers under the flood plains and terraces of the major streams.

Water diverted from streams and distributed by surface ditches is the dominant source of irrigation water. Few wells for irrigation have been drilled. Most wells are for domestic use or for stock water. In some areas well water, or water collected from springs and seeps or in ponds, is distributed by pipeline to help distribute livestock grazing.

There is a nearly perennial shortage of water suitable for irrigation relative to the amount of irrigable land in the survey area, and in most years there is insufficient water to adequately irrigate land now in production. Precipitation and snowmelt provide an adequate supply of water in the mountainous areas, but the supply is inadequate for areas of irrigable land in the eastern part of the area, particularly in the latter part of the growing season.

Some abandoned mines collect and store large amounts of water; however, the water is very high in mineral content and must be significantly improved for most uses.

agriculture

Beef production was the most important agricultural enterprise of the early settlers. Sheep, hogs, and poultry were also raised but in much smaller numbers. Much of the early settlement was along stream terraces. The first right for surface water from the Huerfano River was appropriated in 1861. Irrigated forage crops, small grain, corn, and vegetables were grown.

Nonirrigated farming was at a peak about 1925, following a period of homesteading. Although forage sorghum, corn, pinto beans, and spring grain were grown, winter wheat was the most adaptable crop. It is now the principal nonirrigated crop. Since 1925, the number of farms has decreased and much of the nonirrigated cropland has been seeded to grass. Today about 25,000 acres, including fallow areas, is nonirrigated cropland. Much of the winter wheat is used as winter feed for livestock. Wheat-fallow is the principal cropping system (*10*).

Beef cattle account for most of the value of agricultural products sold. About 4 percent of the survey area is cropland, of which about one-third is irrigated. Because of the limited supply of water for irrigation, hay is the main crop. Most of the hay is used locally to supplement cattle feed in winter.

The Upper Huerfano County Conservation District was organized in June 1940 to assist farmers and ranchers.

climate

In this survey area, summers are warm or hot in most of the valleys but are much cooler in the mountains. Winters are cold in the mountains. The valleys are colder than the lower slopes of adjacent mountains because of cold air drainage. Precipitation occurs in the mountains throughout the year, and a deep snowpack accumulates during winter. In summer the precipitation in valleys falls mainly as showers, but some thunderstorms occur. In winter the ground is covered with snow much of the time. Chinook winds, which blow downslope and are warm and dry, often melt and evaporate the snow (*17*).

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Walsenburg Power Plant for the period 1951-73. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 34.9 degrees F and the average daily minimum temperature is 22 degrees. The lowest temperature on record, -36 degrees, occurred at Walsenburg Power Plant on January 12, 1963. In summer, the average temperature is 69.5 degrees and the average daily maximum temperature is 84.8 degrees. The highest temperature, 100 degrees, was recorded on June 24, 1956.

Growing degree days, shown in table 1, are equivalent to "heat units." Beginning in spring, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 9.68 inches, or 64 percent, usually falls during April through September, which includes the growing season for most crops. Two years in ten, the rainfall from April to September is less than 6.86 inches. The heaviest 1-day rainfall during the period of record was 3 inches at Walsenburg Power Plant on April 13, 1967. Thunderstorms number about 44 each year, 30 of which occur in summer.

The average seasonal snowfall is 78 inches. The greatest snow depth at any one time during the period of record was 24 inches. On the average, 11 days have at least 1 inch of snow on the ground, but the number of days varies greatly from year to year.

The average relative humidity in midafternoon in spring is less than 35 percent; during the rest of the year it is about 45 percent. Humidity is higher at night in all seasons, and the average at dawn is about 77 percent. The percentage of possible sunshine is 77 percent in summer and 73 percent in winter. The prevailing direction of the wind is from the south-southeast. The average windspeed is highest, 10.4 miles per hour, in April.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places.

They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

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

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

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

The 19 map units in this survey have been grouped into 4 general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

soils on stream terraces, fans, and flood plains

This group consists of two map units. It makes up about 3 percent of the survey area. The soils in this group are nearly level to gently sloping. The native vegetation is mainly grass. Some trees are along stream channels. Elevation is 5,500 to 8,600 feet. The average annual precipitation is about 12 to 25 inches, the average annual air temperature is 40 to 54 degrees F, and the average frost-free season is 60 to 165 days.

The soils in this group are deep and are somewhat poorly drained and well drained. They formed in alluvium derived dominantly from sedimentary rock.

This group is used as rangeland and for irrigated hay and pasture.

1. Haverson-Limon-Glenberg

Deep, well drained, nearly level to gently sloping soils; on flood plains, alluvial fans, and low terraces

This map unit is along rivers. Slope is 0 to 3 percent. The vegetation is mainly grass, but there are some cottonwood and willow trees. Elevation is 5,500 to 7,500 feet. The average annual precipitation is about 12 to 16 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free season is 100 to 165 days.

This unit makes up about 2 percent of the survey area. It is about 20 percent Haverson soils, 20 percent Limon soils, and 15 percent Glenberg soils. The remaining 45 percent is components of minor extent.

Haverson soils are nearly level to gently sloping and are on flood plains and low terraces. These soils are deep and well drained. They formed in alluvium derived dominantly from sedimentary rock. The soils are stratified and are medium textured throughout. They are slightly affected by salt and alkali.

Limon soils are nearly level and are on flood plains and alluvial fans. These soils are deep and well drained. They formed in alluvium derived dominantly from clayey shale. The soils are fine textured throughout. They are slightly affected by salt and alkali.

Glenberg soils are nearly level and are on flood plains. These soils are deep and well drained. They formed in alluvium dominantly from sedimentary rock. The soils are moderately coarse textured throughout.

Of minor extent in this unit are poorly drained Riverwash and Las Animas and Apishapa soils; well drained, saline Manvel soils; and well drained Neville soils.

This unit is used as rangeland and irrigated cropland.

If this unit is used for irrigated hay and pasture, the main limitations are the slight salinity of the Haverson soils and the slow permeability and slight salinity of the Limon soils.

Wildlife such as antelope, mule deer, cottontail, jackrabbit, and coyote inhabit this unit. Waterfowl inhabit the bottom land along the Cucharas and Huerfano Rivers. The wetness of the soils allows the production of wetland plants that provide nesting areas and protective cover. Areas used as cropland provide additional food, and windbreaks and environmental plantings provide additional cover.

This unit is poorly suited to homesite development. The main limitation is the hazard of flooding.

2. Collegiate-Manzano

Deep, somewhat poorly drained and well drained, nearly level to gently sloping soils; on flood plains and stream terraces

This map unit is in the western part of the survey area. Slope is 0 to 3 percent. The vegetation is mainly grass.

Some narrowleaf cottonwood trees are adjacent to stream channels. Elevation is 6,200 to 8,600 feet. The average annual precipitation is about 15 to 25 inches, the average annual air temperature is 40 to 50 degrees F, and the average frost-free season is 60 to 130 days.

This unit makes up about 1 percent of the survey area. It is about 50 percent Collegiate soils and 15 percent Manzano soils. The remaining 35 percent is components of minor extent.

Collegiate soils are deep and somewhat poorly drained. They formed in alluvium derived dominantly from sedimentary rock. The soils are medium textured and are underlain by coarse textured material at a depth of 31 inches.

Manzano soils are deep and well drained. They formed in alluvium derived dominantly from sedimentary rock. The soils are medium textured throughout.

Of minor extent in this unit are Breece, Noden, Willowman, and Nunn soils.

This unit is used for irrigated hay and pasture and as rangeland.

If this unit is used for irrigated hay and pasture, the main limitations are the short growing season and the high water table in the Collegiate soils.

Wildlife such as mule deer, mourning dove, cottontail, jackrabbit, and waterfowl inhabit this unit. Waterfowl inhabit the bottom land along the Cucharas and Huerfano Rivers. The wetness of the soils allows the production of wetland plants that provide nesting areas and protective cover. Areas used as cropland provide additional food.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding on the Collegiate and Manzano soils and the high water table in the Collegiate soils.

soils on plains

This group consists of four map units. It makes up about 37 percent of the survey area. The soils in this group are nearly level to very steep. The native vegetation is mainly grass, but there is some pinyon and juniper. Elevation is 5,500 to 6,600 feet. The average annual precipitation is about 11 to 16 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free season is 120 to 165 days.

The soils in this group are shallow to deep and are well drained. They formed in material derived from mixed sources.

Most areas of this group are used as rangeland. A few areas are used for irrigated hay and pasture and as nonirrigated cropland.

3. Wiley-Baca-Kim

Deep, well drained, gently sloping to moderately sloping soils; on uplands

This map unit is in the eastern part of the survey area. Slope is 1 to 9 percent. The vegetation is mainly grass. Elevation is 5,500 to 6,500 feet. The average annual precipitation is about 12 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free season is 125 to 165 days.

This unit makes up about 19 percent of the survey area. It is about 30 percent Wiley soils, 20 percent Kim soils, and 10 percent Baca soils. The remaining 40 percent is components of minor extent.

Wiley soils are gently sloping. These soils are deep and well drained. They formed in loess. The surface layer is medium textured. The subsoil is moderately fine textured. Below this, to a depth of 60 inches or more, the soils are medium textured.

Kim soils are gently sloping to moderately sloping. These soils are deep and well drained. They formed in eolian silt and fine sand derived dominantly from wind-deposited sediment. The soils are medium textured throughout.

Baca soils are gently sloping. These soils are deep and well drained. They formed in loess. The surface layer is medium textured. The subsoil is moderately fine textured. Below this, to a depth of 60 inches or more, the soils are medium textured.

Of minor extent in this unit are Fort Collins, Olney, and Vona soils and somewhat excessively drained Otero soils.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture and for nonirrigated wheat.

If this unit is used for irrigated hay and pasture, the main limitations are lack of readily available water, the moderately slow permeability of the Baca soils, and steepness of slope on the Kim soils. If this unit is used as nonirrigated cropland, the main limitations are the hazard of soil blowing and insufficient precipitation for annual cropping.

Wildlife such as antelope, cottontail, jackrabbit, coyote, and limited numbers of scaled quail and mourning dove inhabit this unit. Areas used as cropland provide additional food, and windbreaks and environmental plantings provide additional cover.

This unit is well suited to homesite development. It has few limitations.

4. Travessilla-Rock outcrop

Shallow, well drained, gently sloping to very steep soils, and Rock outcrop; on ridgetops and canyonsides

This map unit is in the eastern part of the survey area. It is characterized by deeply dissected canyons. Slope is 1 to 45 percent. The vegetation on this unit is mainly grass, pinyon, and juniper. Elevation is 5,500 to 6,200 feet. The average annual precipitation is about 11 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free season is 135 to 165 days.

This unit makes up about 4 percent of the survey area. It is about 55 percent Travessilla soils and 10 percent

Rock outcrop. The remaining 35 percent is components of minor extent.

Travessilla soils are shallow and well drained. They formed in residuum derived dominantly from sandstone. The soils are medium textured and are underlain by sandstone at a depth of 15 inches.

Rock outcrop consists of areas of exposed sandstone.

Of minor extent in this unit are well drained Kim and Wiley soils on foot slopes and uplands.

This unit is used as rangeland.

Wildlife such as antelope, mule deer, cottontail, jackrabbit, coyote and limited numbers of mourning dove and scaled quail inhabit this unit.

This unit is poorly suited to homesite development. The main limitations are depth to bedrock and steepness of slope.

5. Manvel-Penrose-Minnequa

Shallow to deep, well drained, gently sloping to moderately steep soils; on foot slopes and uplands

This map unit is in the eastern part of the survey area. Slope is 1 to 25 percent. The vegetation on the Manvel and Minnequa soils is mainly grass. The vegetation on the Penrose soils is mainly pinyon and juniper. Elevation is 5,500 to 6,300 feet. The average annual precipitation is about 11 to 15 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free season is 120 to 165 days.

This unit makes up about 8 percent of the survey area. It is about 30 percent Manvel soils, 25 percent Penrose soils, and 15 percent Minnequa soils. The remaining 30 percent is components of minor extent.

Manvel soils are on foot slopes and uplands. These soils are deep and well drained. They formed in residuum and colluvium derived dominantly from limestone and shale. The soils are medium textured or moderately fine textured throughout.

Penrose soils are on uplands. These soils are shallow and well drained. They formed in residuum and colluvium derived dominantly from limestone. The soils are medium textured and are underlain by limestone at a depth of 14 inches.

Minnequa soils are on uplands. These soils are moderately deep and well drained. They formed in residuum and locally transported sediment derived dominantly from limestone and shale. The soils are medium textured throughout.

Of minor extent in this unit are Manzanola soils, somewhat excessively drained Otero soils, and Rock outcrop.

Most areas of this unit are used as rangeland. A few areas are used as nonirrigated cropland.

The main limitations of this unit for nonirrigated crops are the hazard of soil blowing and insufficient precipitation.

Wildlife such as antelope, cottontail, jackrabbit, scaled quail, skunks, badger, and coyote inhabit this unit. Trees and brush provide food and cover for limited numbers of mule deer and mourning dove. Areas used as cropland provide additional food, and windbreaks and environmental plantings provide additional cover.

The Manvel and Minnequa soils are well suited to homesite development. The Penrose soils are limited by shallow depth to bedrock, areas of Rock outcrop, and steepness of slope.

6. Manzanola-Razor

Moderately deep and deep, well drained, nearly level to moderately steep soils; on fans, hills, and terraces

This map unit is in the eastern part of the survey area. Slope is 0 to 20 percent. The vegetation is mainly grass. Elevation is 5,500 to 6,600 feet. The average annual precipitation is about 12 to 16 inches, the average annual air temperature is 49 to 54 degrees F, and the average frost-free season is 125 to 165 days.

This unit makes up about 6 percent of the survey area. It is about 45 percent Manzanola soils and 25 percent Razor soils. The remaining 30 percent is components of minor extent.

Manzanola soils are on terraces and fans. These soils are deep and well drained. They formed in alluvium and residuum derived dominantly from shale. The soils are moderately fine textured or fine textured throughout. They are slightly affected by salt and alkali.

Razor soils are on hills. These soils are moderately deep and well drained. They formed in residuum and colluvium derived dominantly from shale. The soils are moderately fine textured throughout. They are slightly affected by salt and alkali.

Of minor extent in this unit are the excessively drained Schamber soils, Limon soils, and shallow Midway soils.

Most areas of this unit are used as rangeland. A few areas, mainly of Manzanola soils, are used for irrigated hay and pasture.

If this unit is used for irrigated hay and pasture, the main limitations are slow permeability, the hazard of erosion, and steepness of slope in some areas.

Wildlife such as mule deer, antelope, mourning dove, scaled quail, cottontail, jackrabbit, coyote, and limited numbers of bobcat and skunks inhabit the unit. Areas used as cropland provide additional food, and windbreaks and environmental plantings provide additional cover.

If this unit is used for homesite development, the main limitations are high shrink-swell potential, slow permeability, and slope.

soils on foothills

This group consists of six map units. It makes up about 42 percent of the survey area. The soils in this group are gently sloping to extremely steep. The native vegetation is mainly grass on the more gently sloping soils and pinyon and juniper on the steeper soils.

Elevation is 6,000 to 8,600 feet. The average annual precipitation is about 11 to 20 inches, the average annual air temperature is 40 to 54 degrees F, and the average frost-free season is 75 to 130 days.

The soils in this group are shallow to deep and are well drained. They formed in residuum, colluvium, alluvium, and eolian material derived dominantly from sandstone, siltstone, shale, and a few areas of igneous rock.

This group is used as rangeland, woodland, and wildlife habitat.

7. Louviers-Travessilla

Shallow, well drained, gently sloping to very steep soils; on ridges and side slopes of dissected plateaus

This map unit is in the central part of the survey area. Slope is 3 to 65 percent. The vegetation is mainly pinyon and juniper. Elevation is 6,300 to 7,500 feet. The average annual precipitation is about 14 to 16 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free season is 100 to 130 days.

This unit makes up about 4 percent of the survey area. It is about 35 percent Louviers soils and 30 percent Travessilla soils. The remaining 35 percent is components of minor extent.

Louviers soils are on side slopes of dissected plateaus. These soils are shallow and well drained. They formed in residuum derived dominantly from clayey shale. The soils are fine textured or moderately fine textured and are underlain by shale at a depth of 16 inches.

Travessilla soils are on ridges and side slopes of dissected plateaus. These soils are shallow and well drained. They formed in residuum derived dominantly from sandstone. The soils are moderately coarse textured and are underlain by sandstone at a depth of 15 inches.

Of minor extent in this unit are deep Noden, Nunn, and Olney soils and moderately deep Progresso soils.

This unit is used as woodland and for livestock grazing.

Wildlife such as mule deer, cottontail, squirrel, porcupine, coyote, and limited numbers of turkey and mourning dove inhabit this unit.

This unit is poorly suited to homesite development. The main limitations are shallow depth to bedrock and steepness of slope.

8. Farisita-Olney-Progresso

Shallow to deep, well drained, gently sloping to very steep soils; on ridges, side slopes, and uplands

This map unit is in the central and west-central parts of the survey area. Slope is 3 to 35 percent. The vegetation is mainly grass on the more gently sloping soils and pinyon and juniper on the steeper soils. Elevation is 6,000 to 7,300 feet. The average annual precipitation is about 13 to 17 inches, the average annual air temperature is 46 to 52 degrees F, and the average frost-free season is 100 to 130 days.

This unit makes up about 7 percent of the survey area. It is about 25 percent Farisita soils, 20 percent Olney soils, and 10 percent Progresso soils. The remaining 45 percent is components of minor extent.

Farisita soils are sloping to steep and are on ridges and side slopes. These soils are shallow and well drained. They formed in residuum and colluvium derived dominantly from conglomeratic sandstone. The soils are moderately coarse textured and are underlain by sandstone at a depth of 12 inches.

Olney soils are gently sloping and are on uplands. These soils are deep and well drained. They formed in eolian material. The surface layer is moderately coarse textured. The subsoil is moderately fine textured. Below this, to a depth of 60 inches or more, the soils are moderately coarse textured.

Progresso soils are in the more steeply sloping areas on uplands. These soils are moderately deep and well drained. They formed in residuum derived dominantly from sandstone. The surface layer is moderately coarse textured. The subsoil is moderately fine textured. Below this, to a depth of of 24 inches, the soils are moderately coarse textured. Unweathered sandstone is at a depth of 24 inches.

Of minor extent in this unit are excessively drained Schamber soils, somewhat excessively drained Otero soils, and well drained Noden and Bond soils. The Schamber, Otero, and Noden soils are deep. The Bond soils are shallow to sandstone.

This unit is used as rangeland, woodland, and wildlife habitat.

Wildlife such as mule deer, cottontail, jackrabbit, coyote, bobcat, porcupine, squirrel, and limited numbers of turkey and mourning dove inhabit the unit.

If this unit is used for homesite development, the main limitation is depth to rock.

9. Noden-Bond

Shallow and deep, well drained, gently sloping to moderately sloping soils; on uplands, foot slopes, and ridges

This map unit is in the south-central and west-central parts of the survey area. Slope is 1 to 18 percent. The vegetation is mainly grass on the uplands and foot slopes, and it is mainly pinyon and juniper on the ridges. Elevation is 6,200 to 7,500 feet. The average annual precipitation is about 15 to 18 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free season is 100 to 125 days.

This unit makes up about 7 percent of the survey area. It is about 55 percent Noden soils and 20 percent Bond soils. The remaining 25 percent is components of minor extent.

Noden soils are on uplands and foot slopes. These soils are deep and well drained. They formed in mixed

sediment. The surface layer is medium textured. The subsoil is moderately fine textured. Below this, to a depth of 60 inches or more, the soils are medium textured.

Bond soils are on ridges. These soils are shallow and well drained. They formed in residuum derived dominantly from sandstone. The surface layer is moderately coarse textured. The subsoil is moderately fine textured. Unweathered sandstone is at a depth of 17 inches.

Of minor extent in this unit are Ring, Olney, Progresso, Louviers, and Travessilla soils. The Ring soils are deep and cobbly. The Olney soils are deep. The Progresso soils are moderately deep over sandstone. The Louviers and Travessilla soils are shallow. They are on steep side slopes and ridges.

Most areas of this unit are used as rangeland. A few areas are used for irrigated and nonirrigated crops. Hay and pasture are the main irrigated crops, and wheat is the main nonirrigated crop.

This unit is well suited to irrigated hay and pasture. The main limitations are insufficient moisture for annual cropping and the hazard of soil blowing.

Wildlife such as mule deer, mourning dove, cottontail, skunks, porcupine, coyote, and limited numbers of turkey inhabit this unit. Areas used as cropland provide additional food and cover.

If this unit is used for homesite development, the main limitation is the shallow depth to bedrock in the Bond soils.

10. Willowman-Curecanti-Nunn

Deep, well drained, gently sloping to moderately steep soils; on fans, terraces, and side slopes

This map unit is in the west and southwestern parts of the survey area. Slope is 2 to 30 percent. The vegetation is mainly grass. Some Gambel oak is on the side slopes. Elevation is 6,500 to 8,200 feet. The average annual precipitation is about 16 to 20 inches, the average annual air temperature is 40 to 52 degrees F, and the average frost-free season is 75 to 130 days.

This unit makes up about 8 percent of the survey area. It is about 25 percent Willowman soils, 20 percent Curecanti soils, and 15 percent Nunn soils. The remaining 40 percent is components of minor extent.

Willowman soils are on terraces and fans. These soils are deep and well drained. They formed in alluvium derived dominantly from sandstone and igneous rock. The surface layer is gravelly and moderately coarse textured. The subsoil is very cobbly and moderately fine textured. Below this, to a depth of 60 inches or more, the soils are very cobbly and moderately coarse textured.

Curecanti soils are on terraces, fans, and side slopes. These soils are deep and well drained. They formed in alluvium derived dominantly from mixed sediment. The surface layer is very cobbly and medium textured. The subsoil is very cobbly and moderately fine textured. Below this, to a depth of 60 inches or more, the soils are very cobbly and coarse textured.

Nunn soils are on terraces and fans. These soils are deep and well drained. They formed in alluvium derived dominantly from mixed sediment. The surface layer is medium textured. The subsoil is fine textured. Below this, to a depth of 60 inches or more, the soils are medium textured or moderately fine textured and have a few rock fragments.

Of minor extent in this unit are Morop, Noden, Denver, and Ring soils. The Morop soils have rock fragments in the substratum. The Noden and Denver soils do not have rock fragments. The Ring soils are on the steeper side slopes.

Most areas of this unit are used as rangeland. A few areas of the Nunn soils are used as irrigated and nonirrigated cropland. Hay and pasture are the main irrigated crops. Small grain such as oats and barley are the main nonirrigated crops.

If this unit is used as irrigated or nonirrigated cropland, the main limitations are the short growing season and some rock fragments on the surface.

Wildlife such as mule deer, cottontail, jackrabbit, mourning dove, bobcat, badger, skunk, and coyote inhabit this unit. Limited numbers of elk also inhabit the unit in winter. Areas used as cropland provide additional food and cover.

The Willowman and Curecanti soils in this unit are well suited to homesite development. The Nunn soils are limited by high shrink-swell potential.

11. Brownsto-Castner-Patent

Shallow to deep, well drained, gently sloping to extremely steep soils; on fans, foot slopes, side slopes, ridges, and mountainsides and in swales

This map unit is in the western part of the survey area. Slope is 2 to 75 percent. The vegetation on the Castner and Brownsto soils is mainly pinyon and juniper. The vegetation on the Patent soils is mainly grass. Elevation is 6,700 to 8,600 feet. The average annual precipitation is about 12 to 16 inches, the average annual air temperature is 42 to 47 degrees F, and the average frost-free season is 80 to 120 days.

This unit makes up about 8 percent of the survey area. It is about 35 percent Brownsto soils, 25 percent Castner soils, and 10 percent Patent soils. The remaining 30 percent are components of minor extent.

Brownsto soils are on mountainsides, foot slopes, and fans. These soils are deep and well drained. They formed in alluvium and colluvium derived dominantly from sandstone. The soils are very channery and very gravelly throughout. The surface layer is medium textured. Below this, to a depth of 60 inches or more, the soils are mainly moderately fine textured.

Castner soils are on side slopes and ridges. These soils are shallow and well drained. They formed in

residuum and colluvium derived dominantly from interbedded sandstone, siltstone, and shale. The soils are very channery and extremely channery. They are medium textured and are underlain by siltstone at a depth of 11 inches.

Patent soils are on fans and foot slopes and in swales. These soils are deep and well drained. They formed in alluvium derived dominantly from sandstone. The soils are medium textured throughout.

Of minor extent in this unit are Noden, Bond, Tolman, and Utica soils and Rock outcrop. The Noden and Utica soils are deep. The Utica soils are excessively drained. The Bond and Tolman soils are shallow over sandstone.

Most areas of this unit are used as rangeland. A few areas of the Patent soils are used as irrigated cropland.

Wildlife such as mule deer, cottontail, squirrel, porcupine, bobcat, and coyote inhabit this unit. In addition, limited numbers of antelope are on the Patent soils and elk are on the Castner soils. Areas used as cropland provide additional food and cover.

The more gently sloping areas of this unit are well suited to homesite development, but the steeper areas are poorly suited. The main limitations are slope and depth to rock.

12. Ustic Torriorthents-Neville-Potts

Shallow to deep, well drained, gently sloping to steep soils; on side slopes and uplands and in drainageways

This map unit is in the western and northwestern parts of the survey area. Slope is 1 to 40 percent. The vegetation is mainly grass. Pinyon and juniper are on the steeper slopes. Elevation is 6,700 to 7,600 feet. The average annual precipitation is about 11 to 14 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free season is 100 to 125 days.

This unit makes up about 8 percent of the survey area. It is about 25 percent Ustic Torriorthents, 20 percent Neville soils, and 15 percent Potts soils. The remaining 40 percent is components of minor extent.

Ustic Torriorthents are extremely rough and eroded soils. They are mainly on side slopes of deeply dissected terraces. These soils are shallow and moderately deep and are well drained. They formed in residuum and colluvium derived dominantly from siltstone and shale. The soils are moderately fine textured. They are underlain by siltstone at a depth of 12 to 40 inches. These soils are slightly salt- and alkali-affected in some areas.

Neville soils are on side slopes and uplands and in drainageways. These soils are deep and well drained. They formed in alluvium and colluvium derived dominantly from sandstone, siltstone, and shale. The soils are medium textured throughout.

Potts soils are on uplands. These soils are deep and well drained. They formed in eolian material and in alluvium derived dominantly from sandstone. The surface layer is moderately coarse textured. The subsoil is moderately fine textured. Below this, to a depth of 60 inches or more, the soils are medium textured or moderately coarse textured.

Of minor extent in this unit are excessively drained Schamber soils, Brownsto soils, and Rock outcrop. The Brownsto soils are deep and have many rock fragments. Rock outcrop occurs as barren sandstone escarpments and exposed areas of shale.

Most areas of this unit are used for wildlife habitat. A few areas are used for irrigated hay and pasture. The Potts and Neville soils are well suited to irrigated hay and pasture.

Wildlife such as mule deer, mourning dove, cottontail, bobcat, badger, skunk, and coyote inhabit this unit. Limited numbers of turkey also inhabit the unit. Areas used as cropland provide additional food, and windbreaks and environmental plantings provide additional cover.

Except for the steeper slopes, this unit is well suited to homesite development. The main limitations are the hazard of erosion and depth to soft rock.

soils on mountains

This group consists of seven map units. It makes up about 18 percent of the survey area. The soils in this group are gently sloping to extremely steep. The native vegetation is mainly grass and conifers. Elevation is 6,800 to 12,000 feet. The average annual precipitation is about 14 to 30 inches, the average annual air temperature is 36 to 47 degrees F, and the average frost-free season is 30 to 100 days.

The soils in this group are shallow to deep and are well drained. They formed in alluvium, colluvium, and residuum derived from granite, igneous rock, sandstone, siltstone, and shale.

This group is used as woodland and rangeland and for wildlife habitat and recreation.

13. Maitland-Bayerton-Ring

Moderately deep and deep, well drained, gently sloping to very steep soils; on mountainsides, foot slopes, uplands, and terraces

This map unit is in the western part of the survey area. Slope is 1 to 60 percent. The vegetation is mainly ponderosa pine. Elevation is 6,800 to 8,500 feet. The average annual precipitation is about 18 to 23 inches, the average annual air temperature is 38 to 47 degrees F, and the average frost-free season is 60 to 100 days.

This unit makes up about 4 percent of the survey area. It is about 20 percent Maitland soils, 20 percent Bayerton soils, and 15 percent Ring soils. The remaining 45 percent is components of minor extent.

Maitland soils are on uplands and foot slopes. These soils are deep and well drained. They formed in colluvium derived dominantly from sandstone and shale. The surface is covered with a mat of twigs and needles.

The surface layer is moderately coarse textured. Below this, to a depth of 60 inches or more, the soils are medium textured or moderately fine textured.

Bayerton soils are on mountainsides and foot slopes. These soils are moderately deep and well drained. They formed in residuum derived dominantly from sandstone. The surface is covered with a mat of pine needles and leaves. The surface layer is moderately coarse textured and has some rock fragments. The subsoil is medium textured or moderately fine textured. Unweathered sandstone is at a depth of 25 inches.

Ring soils are on terraces. These soils are deep and well drained. They formed in alluvium derived dominantly from mixed sediment. The surface is covered with a mat of pine litter. The subsoil is moderately coarse textured and has some rock fragments. Below this, to a depth of 60 inches or more, the soils are fine textured and have many rock fragments.

Of minor extent in this unit are Wahatoya, Noden, Badito, and Breece soils. The Wahatoya and Badito soils are moderately deep and have many rock fragments. The Noden and Breece soils are deep and are in drainageways.

This unit is used as woodland and for livestock grazing and wildlife habitat.

Wildlife such as mule deer, elk, turkey, cottontail, coyote, bobcat, porcupine, squirrel, and limited numbers of band-tailed pigeon inhabit this unit.

If this unit is used for homesite development, the main limitation in most areas is steepness of slope. In the less sloping areas of the unit, moderate shrink-swell potential is the main limitation.

14. Goemmer-Fughes

Moderately deep and deep, well drained, gently sloping to very steep soils; on mountainsides, foot slopes, and benches

This map unit is in the south-central, southwestern, and western parts of the survey area. Slope is 3 to 50 percent. The vegetation is mainly grass on the gently sloping soils and ponderosa pine and oakbrush on the steeper soils. Elevation is 7,300 to 8,500 feet. The average annual precipitation is about 18 to 25 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free season is 70 to 100 days.

This unit makes up about 2 percent of the survey area. It is about 55 percent Goemmer soils and 10 percent Fughes soils. The remaining 35 percent is components of minor extent.

Goemmer soils are on mountainsides. These soils are moderately deep and well drained. They formed in colluvium and residuum derived dominantly from shale and siltstone. The soils are fine textured throughout. Some rock fragments are in the surface layer.

Fughes soils are on foot slopes and benches. These soils are deep and well drained. They formed in colluvium derived dominantly from shale and siltstone. The surface layer is moderately fine textured. The subsoil is fine textured. Below this, to a depth of 60 inches or more, the soils are moderately fine textured.

Of minor extent in this unit are Holderness, Ring, Tolman, and Castner soils. The Holderness soils have bedrock at a depth of 50 inches. The Ring soils are deep and have many rock fragments. The Tolman and Castner soils are shallow over bedrock.

Most areas of this unit are used as rangeland and for wildlife habitat. A few of the more gently sloping areas are used for irrigated hay and pasture.

Wildlife such as elk, mule deer, turkey, cottontail, grouse, and limited numbers of black bear and mountain lion inhabit the unit. Areas used as cropland provide additional food and cover.

This unit is poorly suited to homesite development. The main limitations are high shrink-swell potential and steepness of slope.

15. Leadville-Lakehelen-Uinta

Moderately deep and deep, well drained, gently sloping to extremely steep soils; on mountains and benches

This map unit is in the western and southwestern parts of the survey area. It is mainly on mountainsides, but it is also on mountaintops and benches. Slope is 4 to 80 percent. The vegetation on this unit is mainly conifers. Elevation is 8,000 to 10,000 feet. The average annual precipitation is about 20 to 30 inches, the average annual air temperature is 38 to 45 degrees F, and the average frost-free season is 40 to 70 days.

This unit makes up about 5 percent of the survey area. It is about 25 percent Leadville soils, 20 percent Lakehelen soils, and 10 percent Uinta soils. The remaining 45 percent is components of minor extent.

Leadville soils are on mountainsides. These soils are deep and well drained. They formed in colluvium and residuum derived dominantly from sandstone. The surface is covered with a mat of needles and twigs. The surface layer is moderately coarse textured. The subsoil is moderately fine textured and has many large rock fragments. Below this, to a depth of 60 inches or more, the soils are moderately coarse textured and have many large rock fragments.

Lakehelen soils are on mountains. These soils are moderately deep and well drained. They formed in residuum and colluvium derived dominantly from sandstone. The surface is covered with a mat of needles and twigs. The surface layer is moderately coarse textured. The subsoil is moderately fine textured and has many rock fragments. Unweathered sandstone is at a depth of 28 inches.

Uinta soils are on mountainsides and benches. These soils are deep and well drained. They formed in residuum and colluvium derived dominantly from sandstone. The surface is covered with a mat of forest litter. The surface layer is moderately coarse textured. Below this, to a depth of 60 inches or more, the soils are moderately fine textured.

Of minor extent in this unit are Coldcreek, Tolman, Rogert, and Woodhall soils and Rock outcrop. The Coldcreek soils are deep and moderately coarse textured. The Tolman and Rogert soils are shallow. The Woodhall soils are moderately deep over igneous rock. Rock outcrop consists of long escarpments of sandstone.

This unit is used as woodland and for wildlife habitat and recreation.

Wildlife such as elk, mule deer, black bear, blue grouse, band-tailed pigeon, squirrel, snowshoe hare, chipmunk, porcupine, and limited numbers of mountain lion and lynx inhabit this unit. Trees and brush provide food and cover for these species.

This unit is poorly suited to homesite development. The main limitations are steepness of slope and large rock fragments.

16. Libeg-Gelkie-Coutis

Deep, well drained, gently sloping to very steep soils; on uplands, fans, terraces, and side slopes along drainageways

This map unit is in the western and northwestern parts of the survey area. Slope is 3 to 45 percent. The vegetation is mainly grass. Elevation is 8,300 to 9,800 feet. The average annual precipitation is about 14 to 23 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free season is 50 to 75 days.

This unit makes up about 4 percent of the survey area. It is about 35 percent Libeg soils, 20 percent Gelkie soils, and 15 percent Coutis soils. The remaining 30 percent is components of minor extent.

Libeg soils are on fans, terraces, and side slopes along deeply entrenched drainageways. These soils are deep and well drained. They formed in alluvium and colluvium derived dominantly from mixed sediment. The soils are medium textured and have many small rock fragments throughout.

Gelkie soils are on uplands. These soils are deep and well drained. They formed in alluvium and colluvium derived dominantly from sandstone and siltstone. The surface layer is moderately coarse textured. The subsoil is medium textured. Below this, to a depth of 60 inches or more, the soils are moderately coarse textured.

Coutis soils are on fans and terraces. These soils are deep and well drained. They formed in alluvium and colluvium derived dominantly from mixed sediment. The soils are moderately coarse textured throughout.

Of minor extent in this unit are deep Breece soils, moderately deep Benteen, Lymanson, and Woodhall soils, and shallow Rogert soils.

This unit is used as rangeland.

Wildlife such as antelope, elk, cottontail, grouse, snowshoe hare, coyote, and limited numbers of mule deer, bear, and mountain lion inhabit this unit.

The main limitation of this unit for homesite development is steepness of slope; however, the less sloping areas of the unit are well suited to homesite development.

17. Larkson-Mortenson-Wetmore

Shallow and deep, well drained, sloping to very steep soils; on mountainsides, ridges, fans, and foot slopes

This map unit is in the north-central part of the survey area. Slope is 5 to 50 percent. The vegetation is mainly conifers. Elevation is 7,000 to 8,600 feet. The average annual precipitation is about 21 to 25 inches, the average annual air temperature is 42 to 44 degrees F, and the average frost-free season is 75 to 90 days.

This unit makes up about 1 percent of the survey area. It is about 40 percent Larkson soils, 15 percent Mortenson soils, and 15 percent Wetmore soils. The remaining 30 percent is components of minor extent.

Larkson soils are on fans and foot slopes. These soils are deep and well drained. They formed in alluvium and colluvium derived dominantly from clayey shale. The surface is covered with a mat of pine litter. The surface layer is medium textured and has a few large rock fragments. Below this, to a depth of 60 inches or more, the soils are fine textured.

Mortenson soils are on north- and west-facing mountainsides. These soils are deep and well drained. They formed in colluvium and residuum derived dominantly from granite. The surface is covered with a mat of needles. The surface layer is medium textured and has many large rock fragments. Below this, to a depth of 60 inches or more, the soils are fine textured and have many rock fragments.

Wetmore soils are on ridges and on south- and east-facing mountainsides. These soils are shallow and well drained. They formed in residuum derived dominantly from granite. The surface is covered with a mat of needles, leaves, and twigs. The soils are moderately coarse textured and have many rock fragments. Granite is at a depth of 14 inches.

Of minor extent in this unit are Castner and Ring soils and Rock outcrop. The Castner soils are shallow over siltstone. The Ring soils are deep, are fine textured, and have many rock fragments.

This unit is used as woodland and for wildlife habitat and recreation.

Wildlife such as mule deer, turkey, cottontail, elk, grouse, and limited numbers of black bear, bobcat, mourning dove, and band-tailed pigeon inhabit this unit.

This unit is poorly suited to homesite development. The main limitations are high shrink-swell potential, slow permeability, and steepness of slope. In some areas the shallow depth to bedrock is also a limitation.

18. Rubble Land-Rock outcrop

Areas of rock debris and Rock outcrop; on high mountain slopes and peaks

This map unit is in the western part of the survey area. It is characterized by large areas of rockslides and Rock

outcrop that support very little vegetation. Slope is more than 50 percent. Elevation is 9,000 to 12,000 feet. The average annual precipitation is about 20 to 25 inches, the average annual air temperature is 36 to 42 degrees F, and the average frost-free season is 30 to 60 days.

This unit makes up about 1 percent of the survey area. It is about 50 percent Rubble Land and 50 percent Rock outcrop.

Rubble Land consists of large areas of rock debris. Rock outcrop consists of areas of exposed igenous rock.

Wildlife such as pika, ptarmigan, and mountain sheep inhabit this unit.

This unit is poorly suited to homesite development.

19. Rogert-Montez-Woodhall

Shallow to deep, well drained, sloping to very steep soils; mainly on ridges and mountains

This map unit is in the western part of the survey area. it is mainly on ridges and mountains. It is also on foot slopes and side slopes. Slope is 5 to 65 percent. The vegetation is mainly grass and conifers. Elevation is 8,500 to 10,000 feet. The average annual precipitation is about 18 to 25 inches, the average annual air temperature is 36 to 42 degrees F, and the average frost-free season is 40 to 70 days.

This unit makes up about 1 percent of the survey area. It is about 40 percent Rogert soils, 35 percent Montez soils, and 10 percent Woodhall soils. The remaining 15 percent is components of minor extent.

Rogert soils are on mountainsides and ridges. These soils are shallow and well drained. They formed in residuum derived dominantly from granite. The soils are moderately coarse textured and have many rock fragments. Granite is at a depth of 16 inches.

Montez soils are on side slopes. These soils are deep and well drained. They formed in colluvium derived dominantly from granite. The surface is covered with a mat of forest litter. The surface layer is moderately coarse textured. The subsoil is moderately fine textured. Below this, to a depth of 50 inches, the soils are coarse textured. Unweathered granite is at a depth of 50 inches.

Woodhall soils are on mountains. These soils are moderately deep and well drained. They formed in residuum and colluvium derived dominantly from igneous and sedimentary rock. The surface layer is medium textured. The subsoil is moderately fine textured. Below this, to a depth of 26 to 34 inches, the soils are moderately fine textured or medium textured. Unweathered granite or sandstone is at a depth of 26 to 34 inches.

Of minor extent in this unit are Lakehelen, Loberg, Coutis, and Libeg soils. The Lakehelen soils are shallow over sandstone. The Loberg soils are deep and clayey. The Coutis and Libeg soils are deep. They are on uplands and in drainageways at the foot of mountains.

This unit is used as summer rangeland, as woodland, and for recreation and wildlife habitat.

Wildlife such as elk, mule deer, bear, grouse, band-tailed pigeon, snowshoe hare, porcupine, coyote, and limited numbers of mountain lion and lynx inhabit this unit.

This unit is poorly suited to homesite development. The main limitation is steepness of slope. In many areas the shallow depth to bedrock is also a limitation.

detailed soil map units

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

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Noden loam, 1 to 9 percent slopes, is one of several phases in the Noden series.

Some map units are made up of two or more major soils. These map units are called soil complexes and soil associations.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Bayerton-Maitland complex, 25 to 50 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Wetmore-Mortenson Association, 20 to 50 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

This survey was mapped at two levels of intensity, or detail. The more detailed part is identified by narrowly defined units, and the less detailed part is identified by broadly defined units. In the narrowly defined units the soil delineation boundaries were plotted and verified at closely spaced intervals. In the broadly defined units the soil delineation boundaries were plotted and verified by some observations. The intensity of mapping was based on the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use. On the soil map legend at the back of this survey, the broadly defined units are identified by an asterisk following the map unit name.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

map unit descriptions

1—Apishapa silty clay. This deep, poorly drained soil is on flood plains and alluvial fans. It formed in alluvium derived dominantly from shale. Slope is 0 to 2 percent. The native vegetation is mainly salt-tolerant grasses. Elevation is 5,500 to 6,000 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 135 to 160 days.

Typically, the surface layer is grayish brown silty clay about 6 inches thick. The substratum to a depth of 60 inches or more is mottled silty clay. The soil is

moderately alkaline to a depth of 24 inches and strongly alkaline below that depth. It is moderately saline.

Included in this unit is about 5 percent well drained Manzanola clay loam.

Permeability of this Apishapa soil is slow. Available water capacity is moderate. Effective rooting depth is limited by the seasonal high water table that is at a depth of 12 to 36 inches from May to July. This soil is subject to brief periods of flooding in spring and early in summer. Runoff is very slow to ponded, and the hazard of water erosion is slight.

This unit is used as rangeland and for irrigated hay and pasture.

The potential plant community on this unit is mainly alkali sacaton, alkali bluegrass, western wheatgrass, and sedge. The average annual production of air-dry vegetation is about 2,150 pounds per acre. If the condition of the range deteriorates, inland saltgrass, kochia, and scratchgrass increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for irrigated hay and pasture, the main limitations are the seasonal high water table and salinity. The concentration of salts and alkali in the surface layer limits the production of plants suitable for hay and pasture. Leaching the salts from the surface layer is limited by the high water table. Drainage and irrigation water management reduce the concentration of salts. Salt-tolerant species are most suitable for planting.

Irrigation water can be applied by corrugations and by flooding from contour ditches. Because of the slow permeability of the soil in this unit, the application of water should be regulated so that water does not stand on the surface and damage the crops. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. If properly managed, this unit can produce 4 tons of irrigated grass hay per acre.

If this unit is used for windbreaks and environmental plantings, the main limitations are the seasonal high water table and salinity. Only trees and shrubs that tolerate wetness and salinity should be planted.

This unit is poorly suited to homesite development. The main limitations are the seasonal high water table, shrink-swell potential, and the hazard of flooding.

This map unit is in capability subclasses IVw, irrigated, and VIw, nonirrigated. It is in Salt Meadow range site.

2—Baca loam, 1 to 3 percent slopes. This deep, well drained soil is on uplands. It formed in calcareous loess. The native vegetation is mainly grass. Elevation is 5,500 to 6,300 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 125 to 165 days.

Typically, the surface layer is brown loam about 3 inches thick. The subsoil is mainly silty clay loam about 27 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is neutral to a depth of 6 inches, mildly alkaline to a depth of 23 inches, and moderately alkaline below that depth.

Included in this unit is about 10 percent Wiley loam on ridges.

Permeability of this Baca soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture and nonirrigated wheat.

The potential plant community on this unit is mainly blue grama. Other grasses that characterize this unit are western wheatgrass and sideoats grama. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, threeawn, snakeweed, cholla, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to irrigated hay and pasture. Irrigation water can be applied by corrugations or by flooding from contour ditches. Because of the moderately slow permeability of the soil in this unit, the length of runs should be adjusted to permit adequate infiltration of water. Rotation grazing helps to maintain the quality of forage. Fertilizer is needed to insure optimum growth of grasses and legumes. If properly managed, this unit can produce 4.5 tons of irrigated grass or alfalfa hay per acre.

In areas of nonirrigated cropland, control of soil blowing and conservation of moisture are important concerns. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Soil blowing can be reduced by planting crops in alternate strips at right angles to the prevailing wind. Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry. With good management, this unit can produce 15 bushels per acre of wheat grown in a wheat-fallow cropping system.

This unit is well suited to windbreaks and environmental plantings. The hazard of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and Rocky Mountain juniper. Among the shrubs are plum and lilac.

If this unit is used for homesite development, the main limitation is moderate shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content in the soil material around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

If this unit is used for septic tank absorption fields, absorption lines should be placed below the moderately slowly permeable layer. Increasing the size of the

absorption area helps to compensate for the moderately slow permeability.

The map unit is capability subclasses IIe, irrigated, and IVe, nonirrigated. It is in Loamy Plains range site.

3—Badito very cobbly sandy loam, 25 to 60 percent slopes. This moderately deep, well drained soil is on south-facing mountainsides. It formed in residuum and colluvium derived dominantly from sandstone and conglomerate. The native vegetation is mainly pinyon and juniper. Elevation is 7,500 to 8,700 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 80 to 100 days.

Typically, the surface layer is dark grayish brown very cobbly sandy loam about 7 inches thick. The subsoil is mainly very gravelly sandy clay loam about 9 inches thick. The substratum is very gravelly sandy loam about 19 inches thick over weathered conglomeritic tuff about 8 inches thick. Hard sandstone is at a depth of about 43 inches. The soil is neutral throughout.

Included in this unit is about 20 percent deep Brownsto soils on foot slopes and hilltops. Also included are small areas of Rock outcrop of sandstone or conglomeritic tuff on very steep side slopes.

Permeability of this Badito soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is moderate.

This unit is used for livestock grazing and as woodland.

The potential plant community is mainly pinyon and juniper and an understory of sideoats grama, Indian ricegrass, mountainmahogany, and blue grama. The potential production of the native understory vegetation in normal years is about 800 pounds of air-dry vegetation per acre. Slope limits access by livestock and promotes overgrazing of the less sloping areas.

The pinyon and juniper on this unit have limited economic value; however, woodland products such as fenceposts, firewood, and pinyon nuts are available. Mature stands of trees can produce about 10 to 12 cords of firewood per acre if all trees are removed.

This unit is poorly suited to homesite development. It is limited mainly by steepness of slope.

The map unit is in capability subclass VIIs, nonirrigated. It is in the Pinyon-Juniper woodland site.

4—Bayerton-Maitland complex, 25 to 50 percent slopes. This map unit is on mountainsides and foot slopes. The native vegetation is mainly ponderosa pine. Elevation is 6,800 to 8,500 feet. The average annual precipitation is 18 to 23 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 60 to 90 days.

This unit is 50 percent Bayerton cobbly sandy loam and 30 percent Maitland fine sandy loam. The Bayerton soil is on the steeper mountainsides, and the Maitland soil is on the less sloping foot slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 15 percent Goemmer cobbly clay loam that is underlain by shale. Also included are small areas of Rock outcrop near ridgetops.

The Bayerton soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface is covered with a mat of pine needles and Gambel oak leaves about 1 inch thick. The surface layer is brown cobbly sandy loam 3 inches thick. The subsurface layer is pinkish gray sandy loam 3 inches thick. The subsoil is mainly sandy clay loam 26 inches thick. Sandstone is at a depth of 32 inches. The soil is neutral throughout.

Permeability of the Bayerton soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high.

The Maitland soil is deep and well drained. It formed in colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of partially decomposed pine needles and twigs 2 inches thick. The surface layer is grayish brown fine sandy loam 4 inches thick. The subsurface layer is mainly pinkish gray fine sandy loam 10 inches thick. The subsoil is sandy clay loam 31 inches thick. The substratum to a depth of 60 inches or more is sandy clay loam. The soil is neutral throughout.

Permeability of the Maitland soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for livestock grazing, woodland, recreation, and wildlife habitat.

The potential plant community is mainly ponderosa pine and an understory of Gamble oak, bluegrasses, mountain muhly, and western wheatgrass. The potential production of the native understory vegetation in normal years is about 500 pounds of air-dry vegetation per acre. Steepness of slope limits access by livestock.

This unit is suited to the limited production of ponderosa pine. The site index for ponderosa pine ranges from 50 to 60. On the basis of a site index of 50, the potential production per acre of timber is 3,100 cubic feet or 13,000 board feet (International rule, one-fourth inch kerf) from an even-aged, fully stocked stand of trees 120 years old. Stocking rates vary considerably on this unit. At lower elevations, Gambel oak commonly dominates the site.

Conventional methods of harvesting timber are difficult to use because of slope. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

To provide an adequate seedbed for reforestation, the surface should be chiseled or otherwise disturbed.

Seeding late in fall helps to insure that soil moisture will be adequate for the establishment of seedlings next spring. Suitable seeding mixtures can include Manchar smooth brome, intermediate wheatgrass, and alfalfa.

The Maitland soil can provide transplants of ornamental ponderosa pine. It is limited mainly by steepness of slope. Because the content of rock fragments in the soil is low, tree spades should work well.

This unit is poorly suited to homesite development. The main limitations are steepness of slope and the moderate depth to bedrock in the Bayerton soil.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Ponderosa Pine woodland site.

5—Benteen-Rock outcrop complex, 3 to 18 percent slopes. This map unit is on mountaintops and benches. The native vegetation is mainly grass. Elevation is 8,000 to 9,500 feet. The average annual precipitation is 17 to 22 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 60 to 90 days.

This unit is about 80 percent Benteen loam and about 10 percent Rock outcrop. The Benteen soil dominates the unit, and Rock outcrop occurs as narrow bands. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent deep Breece sandy loam along narrow drainageways.

The Benteen soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from sandstone and slate. Typically, the surface layer is dark grayish brown loam about 6 inches thick. The subsoil is mainly clay loam about 18 inches thick. The substratum is very gravelly loam about 6 inches thick. Slate is at a depth of about 30 inches. The soil is neutral to a depth of 6 inches and mildly alkaline below that depth.

Permeability of the Benteen soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is high to very high.

Rock outcrop consists of slightly exposed areas of steeply inclined sandstone and slate in nearly parallel bands.

This unit is used as summer rangeland.

The potential plant community on this unit is mainly Arizona fescue, mountain muhly, and Parry oatgrass. Other plants that characterize the unit are mountain brome, western wheatgrass, prairie junegrass, needlegrasses, and sedge. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, rubber rabbitbrush, sleepygrass, blue grama, slimstem muhly, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for homesite development, the main limitations are the areas of Rock outcrop, moderate depth to bedrock, and steepness of slope. Shrink-swell potential can be minimized by thoroughly prewetting the foundation area. Cuts needed to provide essentially level building sites can expose bedrock. Excavation for roads and buildings increases the risk of erosion.

This map unit is in capability subclass VIe, nonirrigated. It is in Loamy Park range site.

6—Bond-Rock outcrop complex, 15 to 45 percent slopes. This map unit is on long, narrow slopes of foothills and ridges. The native vegetation is mainly pinyon and juniper. Elevation is 6,300 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 49 to 54 degrees F, and the average frost-free period is 100 to 125 days.

This unit is about 60 percent Bond sandy loam and about 25 percent Rock outcrop. The Bond soil is throughout the unit, and Rock outcrop is on upper side slopes and ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 15 percent deep Noden sandy loam on foot slopes and in drainageways.

The Bond soil is shallow and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is sandy clay loam about 13 inches thick. Sandstone is at a depth of 17 inches. The soil is neutral throughout.

Permeability of the Bond soil is moderately slow. Available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is high, and the hazard of water erosion is very high.

Rock outcrop consists of nearly barren areas of sandstone or projections of sandstone that form nearly vertical escarpments.

This unit is used as woodland and for livestock grazing.

The potential plant community is mainly pinyon and juniper and an understory of Gambel oak, mountainmahogany, Scribner needlegrass, Indian ricegrass, and muttongrass. The potential production of native understory vegetation in normal years is about 800 pounds of air-dry vegetation per acre. Steepness of slope limits access by livestock.

Woodland products such as firewood, fenceposts, Christmas trees, and pinyon nuts can be obtained from this unit. Mature stands of trees can produce 6 to 8 cords of firewood per acre if all standing dead trees are removed. Removing standing dead trees and harvesting the green overstory generally enhance reproduction and promote the growth of grass and younger trees. Only the foot slopes and ridges generally are accessible because of the steepness of slope, which limits the harvesting of trees.

This unit is poorly suited to homesite development. The main limitations are steepness of slope and shallow depth to hard bedrock.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Pinyon-Juniper woodland site.

7—Breece sandy loam, 2 to 18 percent slopes. This deep, well drained soil is in drainageways and on foot slopes. It formed in alluvium and colluvium. The native vegetation is mainly grass. Elevation is 7,000 to 8,500 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 75 to 115 days.

Typically, the surface layer is dark grayish brown sandy loam about 14 inches thick. The next layer is sandy loam about 19 inches thick. The substratum to a depth of 60 inches or more is gravelly sandy loam. The soil is neutral throughout.

Included in this unit is about 10 percent Collegiate loam near stream channels and near small seeps on foot slopes. This soil is subject to flooding. Also included in the unit are small areas of Trag loam on foot slopes.

Permeability of this Breece soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight to very high, depending on steepness of slope.

This unit is used as rangeland and for irrigated hay and pasture.

The potential plant community on this unit is mainly mountain muhly, Arizona fescue, and Parry oatgrass. Other grasses that characterize the unit are mountain brome, needlegrasses, and western wheatgrass. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, western wheatgrass, slimstem muhly, needlegrasses, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to irrigated hay and pasture. The choice of crops is limited mainly to grass because of the short growing season. Irrigation water can be applied by corrugations or by flooding from contour ditches. Leveling helps to insure the uniform application of water. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Nonleguminous crops respond to nitrogen and phosphorus. Leguminous crops respond to phosphorus. If properly managed, this unit can produce 3 tons of irrigated grass hay per acre.

If this unit is used for homesite development, the main limitations are slope in the steeper areas and the hazard of erosion on these slopes. The risk of erosion is increased if the soil is left exposed during site development. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour. Access roads should be designed to control surface runoff and help stabilize cut slopes.

This map unit is in capability subclass IVe, irrigated and nonirrigated. It is in Loamy Park range site.

8—Brownsto very gravelly loam, 3 to 15 percent slopes. This deep, well drained soil is on fans. It formed in alluvium and colluvium. The native vegetation is mainly pinyon and juniper. Elevation is 6,700 to 8,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 42 to 44 degrees F, and the average frost-free period is 90 to 120 days.

Typically, the surface layer is light brown very gravelly loam about 5 inches thick. The subsoil is very gravelly loam about 14 inches thick. The substratum to a depth of 60 inches or more is very gravelly sandy loam. The soil is moderately alkaline to a depth of 19 inches and strongly alkaline below that depth.

Included in this unit is about 10 percent Patent loam in small parks.

Permeability of this Brownsto soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used for livestock grazing and wildlife habitat and as woodland.

The potential plant community is mainly pinyon and juniper and an understory of blue grama, Indian ricegrass, sideoats grama, and mountainmahogany. The potential production of the native understory vegetation in normal years is about 500 pounds of air-dry vegetation per acre. Chaining the pinyon and juniper can increase the production of understory forage plants.

Range seeding is most successful if done in conjunction with chaining. Following chaining, proper grazing management is needed to reduce erosion and to lengthen the lifespan of the clearings. Range seeding generally is limited to the broadcast method because of the gravel and cobbles in the surface layer. Suitable seeding mixtures can include adapted wheatgrasses, Russian wildrye, and blue grama.

Woodland products such as firewood, fenceposts, Christmas trees, and pinyon nuts are available on this unit. Mature stands of trees can produce 12 to 14 cords of firewood per acre if all standing dead trees are removed. Removing standing dead trees and harvesting the green overstory generally enhance reproduction and promote the growth of grass and younger trees. Trees for transplanting can be obtained from this unit; however, the use of spades for removing these trees is severely limited by the high content of gravel and cobbles.

This unit is well suited to homesite development; however, the large amount of rock fragments in the soil makes excavation difficult. Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass VIe, nonirrigated. It is in the Pinyon-Juniper woodland site.

9—Brownsto very channery loam, 15 to 75 percent slopes. This deep, well drained soil is on mountainsides and foot slopes, mainly below areas of Rock outcrop. It formed in colluvium derived dominantly from sandstone.

The native vegetation is mainly pinyon and juniper. Elevation is 7,000 to 8,200 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 42 to 44 degrees F, and the average frost-free period is 90 to 120 days.

Typically, the surface layer is grayish brown very channery loam 4 inches thick. The subsoil is very gravelly sandy clay loam about 13 inches thick. The upper 15 inches of the substratum is very gravelly sandy clay loam, and the lower part to a depth of 60 inches or more is very gravelly sandy loam. The soil is mildly alkaline to a depth of 4 inches and moderately alkaline below that depth. In some areas the surface layer is very cobbly sandy loam.

Included in this unit are small areas of Castner and Goemmer soils. Also included are small areas of Rock outcrop on ridges.

Permeability of this Brownsto soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland and for livestock grazing and wildlife habitat.

The potential plant community is mainly pinyon and juniper and an understory of blue grama, Indian ricegrass, Scribner needlegrass, mountainmahogany, and mountain muhly. The potential production of the native understory vegetation in normal years is about 600 pounds of air-dry vegetation per acre. Slope limits access by livestock and results in overgrazing of the less sloping areas.

Woodland products such as fenceposts, firewood, and pinyon nuts are available on this unit; however, steepness of slope limits access to remove these products.

This unit is poorly suited to homesite development. It is limited mainly by steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Pinyon-Juniper woodland site.

10—Castner very channery loam, 20 to 70 percent slopes. This shallow, well drained soil is on side slopes and ridges. It formed in residuum and colluvium derived dominantly from interbedded sandstone and siltstone and from shale. The native vegetation is mainly pinyon and juniper. Elevation is 8,000 to 8,600 feet. The average annual precipitation is 13 to 16 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 80 to 110 days.

Typically, the surface layer is dark grayish brown very channery loam 3 inches thick over extremely channery loam about 8 inches thick. Siltstone is at a depth of 11 inches. The soil is mildly alkaline throughout.

Included in this unit is about 10 percent Brownsto very channery loam on foot slopes and in narrow drainageways. Also included are small areas of Rock outcrop on ridgetops and on the steeper side slopes.

Permeability of this Castner soil is moderate. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is medium to rapid, and the hazard of water erosion is high to very high.

This unit is used as woodland and for livestock grazing and wildlife habitat.

The potential plant community is mainly pinyon and juniper and an understory of mountainmahagony, Indian ricegrass, sideoats grama, and blue grama. The potential production of the native understory vegetation in normal years is about 500 pounds of air-dry vegetation per acre. Slope limits access by livestock and results in overgrazing of the less sloping areas.

Woodland products such as high-quality fenceposts, firewood, Christmas trees, and pinyon nuts are available on this unit. Mature stands of trees can produce 4 to 7 cords of firewood per acre if all standing dead trees are removed; however, steepness of slope limits access to remove firewood and fenceposts. Trees for transplanting can be obtained from this unit.

This unit is poorly suited to homesite development. The main limitations are steepness of slope and shallow depth to bedrock.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Pinyon-Juniper woodland site.

11—Coldcreek cobbly sandy loam, 25 to 80 percent slopes. This deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived dominantly from interbedded sandstone and siltstone. The native vegetation is mainly coniferous forest. Elevation is 7,500 to 9,000 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is 50 to 70 days.

Typically, the surface is covered with a mat of partially decomposed and undecomposed needles and twigs about 2 inches thick. The surface layer is light brownish gray cobbly sandy loam about 14 inches thick. The next layer is very pale brown very cobbly sandy loam 11 inches thick. The upper 12 inches of the subsoil is very cobbly sandy clay loam, and the lower 13 inches is very cobbly clay loam. Sandstone is at a depth of 50 inches. The soil is slightly acid to a depth of 14 inches and medium acid below that depth.

Included in this unit is about 15 percent Trag loam at the base of slopes.

Permeability of this Coldcreek soil is moderate. Available water capacity is high. Effective rooting depth is 40 to 60 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland and for wildlife habitat and recreation.

The potential plant community is mainly Douglas-fir and white fir and an understory of kinnikinnick, common juniper, sedge, and nodding bromegrass. The potential production of the native understory vegetation in normal years is about 100 pounds of air-dry vegetation per acre.

This unit is suited to limited production of Douglas-fir. On the basis of a site index of 55, the potential

production per acre of timber is 4,400 cubic feet or 15,000 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 120 years old.

Conventional methods of harvesting timber are difficult to use because of slope. Steepness of slope limits felling, yarding, and road construction. Minimizing the risk of erosion is essential in harvesting timber. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

Suitable seeding mixtures for use in reforestation can include manchar smooth brome, orchardgrass, and intermediate or pubescent wheatgrass. Seeding late in fall helps to insure that soil moisture will be adequate for the establishment of seedlings next spring. To provide an adequate seedbed, the surface should be chiseled or otherwise disturbed. Planting trees on the contour helps to control erosion. Additional protection can be provided by interplanting with a cover crop.

This unit is poorly suited to homesite development. It is limited mainly by steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Douglas-fir woodland site.

12—Collegiate loam, 1 to 3 percent slopes. This deep, somewhat poorly drained soil is on flood plains and low terraces. It formed in alluvium. The native vegetation is mainly meadow grasses. Elevation is 7,600 to 8,600 feet. The average annual precipitation is 18 to 25 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 60 to 90 days.

Typically, the surface layer is dark grayish brown loam about 31 inches thick. The substratum to a depth of 60 inches or more is gleyed and mottled very gravelly sand. The soil is neutral throughout.

Included in this unit is about 15 percent Breece sandy loam in the better drained areas of the unit.

Permeability of this Collegiate soil is moderate. Available water capacity is low. Effective rooting depth is limited by the seasonal high water table that is at a depth of 12 to 36 inches from March to July. The soil is subject to brief periods of flooding in spring and early in summer. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for irrigated hay and pasture. A few areas are used as rangeland.

This unit is better suited to irrigated hay and pasture than to most other crops. The period of cutting or grazing increases the risk of winterkill. The choice of crops is limited to grasses because of wetness and the relatively short growing season. Irrigation water can be applied by corrugations and by flooding from contour ditches. Because the underlying sand and gravel can be exposed, onsite investigation may be needed before leveling. Grazing when the soil is wet results in compaction of the surface layer. Most crops respond to nitrogen and phosphorus fertilizer. If properly managed, this unit can produce 3.5 tons of irrigated grass hay per acre.

The potential plant community on this unit is mainly tufted hairgrass, slender wheatgrass, Nebraska sedge, and ovalhead sedge. The average annual production of air-dry vegetation is about 3,000 pounds per acre. If the condition of the range deteriorates, Baltic rush, iris, shrubby cinquefoil, and willow increase. Range seeding is suitable if the range is in poor condition.

This unit is poorly suited to homesite development. The main limitations are the seasonal high water table and the hazard of flooding.

This map unit is in capability subclass Vw, irrigated and nonirrigated. It is in Mountain Meadow range site.

13—Crooked Creek silty clay loam. This deep, poorly drained soil is on flood plains and terraces. It formed in clayey alluvium. Slope is 0 to 2 percent. The native vegetation is mainly grass. Elevation is 6,800 to 7,500 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 80 to 110 days.

Typically, the surface layer is dark gray silty clay loam about 7 inches thick. The upper part of the substratum is silty clay about 38 inches thick, and the lower part to a depth of 60 inches or more is silt loam. The soil is mildly alkaline to a depth of 19 inches and moderately alkaline below that depth.

Included in this unit is about 10 percent Glenberg sandy loam near stream channels. Also included are small areas of Manzano loam on the upper part of terraces.

Permeability of this Crooked Creek soil is slow. Available water capacity is high. Effective rooting depth is limited by seasonal high water table that is at a depth of 12 to 30 inches from January to July. Runoff is slow, and the hazard of water erosion is slight. The soil is subject to brief periods of flooding in spring and early in summer.

Most areas of this unit are used for irrigated hay and pasture. A few areas are used as rangeland.

The choice of crops is limited to grasses because of the seasonal high water table and the short growing season. This unit is well suited to irrigated hay and pasture. Irrigation water can be applied by corrugations and by flooding from contour ditches. Because of the slow permeability of soil, the length of runs should be adjusted to permit adequate infiltration of water.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 3.5 tons of irrigated grass hay per acre.

The potential plant community on this unit is mainly tufted hairgrass, slender wheatgrass, sedge, and willow.

The average annual production of air-dry vegetation is about 2,500 pounds per acre. If the condition of the range deteriorates, ovalhead sedge, Baltic rush, Canada bluegrass, and willow increase. Range seeding is suitable if the range is in poor condition.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding, the seasonal high water table, and shrink-swell potential.

This map unit is in capability subclasses IVw, irrigated, and Vw, nonirrigated. It is in Mountain Meadow range site.

14—Curecanti very cobbly loam, 2 to 8 percent slopes. This deep, well drained soil is on fans, terraces, and side slopes. It formed in mixed alluvium. The native vegetation is mainly grass. Elevation is 7,000 to 8,200 feet. The average annual precipitation is 15 to 17 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 75 to 100 days.

Typically, the surface layer is dark reddish gray very cobbly loam about 15 inches thick. The upper part of the subsoil is very cobbly sandy clay loam about 14 inches thick, and the lower part is very cobbly sandy loam about 9 inches thick. The substratum to a depth of 60 inches or more is very cobbly loamy sand. The soil is neutral throughout.

Included in this unit is about 10 percent Morop loam in depressional areas. Also included are small areas of deep sandy loam and gravelly sandy loam along drainageways.

Permeability of this Curecanti soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used as rangeland.

The potential plant community on this unit is mainly needleandthread, western wheatgrass, little bluestem, and big bluestem. The average annual production of air-dry vegetation is about 1,250 pounds per acre. If the condition of the range deteriorates, blue grama, sleepygrass, Gambel oak, and New Mexico locust increase. Range seeding generally is limited to the broadcast method because of the large amount of gravel in the surface layer.

This unit is well suited to homesite development; however, the large amount of rock fragments in the soil makes excavation difficult.

This map unit is in capability subclass VIIs, nonirrigated. It is in Rocky Foothills range site.

15—Denver clay loam, 4 to 25 percent slopes. This deep, well drained soil is on uplands. It formed in residuum and colluvium derived dominantly from clayey shale. The native vegetation is mainly grass. Elevation is 6,600 to 7,200 feet. The average annual precipitation is 15 to 17 inches, the average annual air temperature is 46 to 50 degrees F, and the average frost-free period is 100 to 125 days.

Typically, the surface layer is grayish brown clay loam about 8 inches thick. The subsoil is clay about 30 inches thick. The substratum to a depth of 60 inches or more is clay. The soil is neutral to a depth of 11 inches, mildly alkaline to a depth of 23 inches, and moderately alkaline below that depth.

Included in this unit is about 20 percent Razor silty clay on the steeper side slopes. Also included are small areas of Goemmer cobbly clay loam.

Permeability of this Denver soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high to very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly western wheatgrass, green needlegrass, and native bluegrass. Other grasses that characterize the unit are needleandthread and blue grama. The average annual production of air-dry vegetation is about 950 pounds per acre. If the condition of the range deteriorates, blue grama, cheatgrass, and gumweed increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for homesite development, the main limitations are shrink-swell potential and slow permeability.

This map unit is in capability subclass VIe, nonirrigated. It is in Clayey Foothills range site.

16—Farisita very gravelly sandy loam, 10 to 35 percent slopes. This shallow, well drained soil is on ridges and side slopes. It formed in residuum and colluvium derived dominantly from sandstone and conglomerate. The native vegetation is mainly pinyon and juniper. Elevation is 6,000 to 7,300 feet. The average annual precipitation is 13 to 17 inches, the average annual air temperature is 46 to 52 degrees F, and the average frost-free period is 100 to 130 days.

Typically, the surface layer is brown very gravelly sandy loam about 4 inches thick. The next layer is coarse sandy loam about 8 inches thick. The substratum, to a depth of 24 inches, is soft, weathered sandstone (fig. 1). Hard sandstone is at a depth of 24 inches. The soil is neutral throughout.

Included in this unit is about 10 percent moderately deep Progresso sandy loam in the less sloping areas of the unit. Also included are small areas of deep Olney sandy loam in drainageways and on foot slopes.

Permeability of this Farisita soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high to very high.

This unit is used for livestock grazing, woodland, and wildlife habitat.

The potential plant community is mainly pinyon and juniper and an understory of big bluestem, little bluestem, Scribner needlegrass, and Indian ricegrass. The potential production of the native understory vegetation in normal years is about 600 pounds of air-dry vegetation per acre.

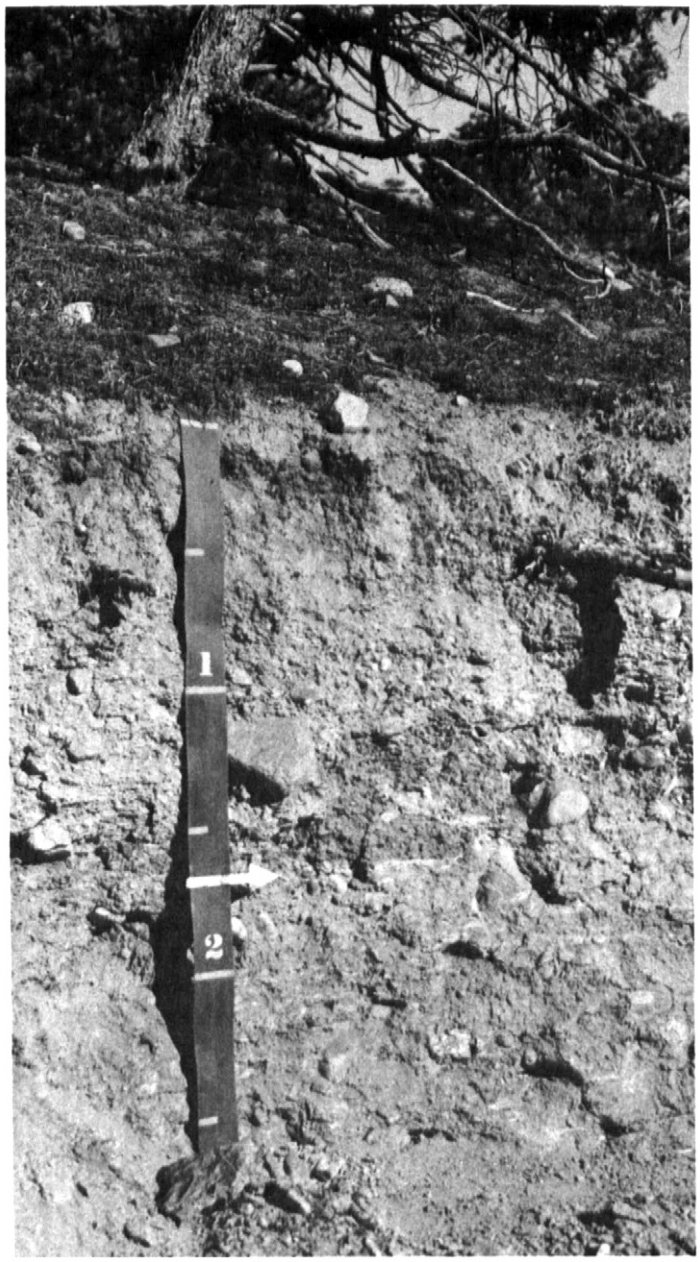


Figure 1.—Profile of Farisita very gravelly sandy loam, 10 to 35 percent slopes. The arrow indicates the soft bedrock.

Woodland products such as firewood, fenceposts, and pinyon nuts are available on this unit. Removal of standing dead trees and thinning the green overstory promote the growth of grass and younger trees. Leaving high juniper stumps with several small live branches promotes the growth of a fencepost crop.

This unit is poorly suited to homesite development. The main limitations are shallow depth to bedrock and steepness of slope.

The map unit is in capability subclass VIIe, nonirrigated. It is in the Pinyon-Juniper woodland site.

17—Fort Collins loam, 1 to 3 percent slopes. This deep, well drained soil is on uplands. It formed in eolian silt and fine sand. The native vegetation is mainly grass. Elevation is 5,500 to 6,300 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 125 to 150 days.

Typically, the surface layer is grayish brown loam about 4 inches thick. The subsoil is clay loam about 19 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is neutral to a depth of 4 inches, mildly alkaline to a depth of 23 inches, and moderately alkaline below that depth.

Included in this unit is about 10 percent Baca loam in swales and drainageways.

Permeability of this Fort Collins soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight to moderate.

This unit is used mainly as rangeland. It is also used as irrigated and nonirrigated cropland. Hay and pasture are the main irrigated crops. Wheat is the main nonirrigated crop.

The potential plant community on this unit is mainly blue grama. Other grasses that characterize the unit are western wheatgrass and sideoats grama. The average annual production of air-dry vegetation is about 1,000 pounds per acre. If the condition of the range deteriorates, threeawn, cholla, pricklypear, and snakeweed increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to irrigated hay and pasture. Irrigation water can be applied by corrugations and by flooding from contour ditches. Leveling helps to insure the uniform application of water. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 4.5 tons of irrigated alfalfa hay per acre.

In areas of nonirrigated cropland, control of soil blowing and conservation of moisture are important concerns. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Soil blowing can be reduced by planting crops in alternate strips at right angles to the prevailing wind.

Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. With good management, this unit can produce 14 bushels per acre of wheat grown in a wheat-fallow cropping system.

This unit is well suited to windbreaks and environmental plantings. The hazard of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and Chinese elm. Among the shrubs are Siberian peashrub and lilac.

This unit is well suited to homesite development.

This map unit is in capability subclasses IIe, irrigated, and IVe, nonirrigated. It is in Loamy Plains range site.

18—Fort Collins loam, 3 to 9 percent slopes. This deep, well drained soil is on uplands. It formed in eolian silt and fine sand. The native vegetation is mainly grass. Elevation is 5,500 to 6,300 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 125 to 150 days.

Typically, the surface layer is grayish brown loam about 4 inches thick. The subsoil is clay loam about 19 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is neutral to a depth of 4 inches, mildly alkaline to a depth of 23 inches, and moderately alkaline below that depth.

Included in this unit is about 10 percent Olney sandy loam on ridges. Also included are small areas of Baca loam in swales.

Permeability of this Fort Collins soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is moderate to very high.

Most areas of this unit are used as rangeland. A few areas are used as irrigated and nonirrigated cropland. Hay and pasture are the main irrigated crops. Wheat is the main nonirrigated crop. Areas of nonirrigated cropland are highly susceptible to water erosion and soil blowing and generally should be reseeded to grass.

The potential plant community on this unit is mainly blue grama. Other grasses that characterize the unit are western wheatgrass and sideoats grama. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, threeawn, snakeweed, cholla, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for irrigated hay and pasture, the main limitations are the steepness of slope and the hazard of erosion. Irrigation water can be applied by flooding from contour ditches. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Seedbed preparation should be on the contour or across the slope where practical.

Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 3.5 tons of irrigated alfalfa hay per acre.

This unit is well suited to windbreaks and environmental plantings. The hazard of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and Rocky Mountain juniper. Among the shrubs are plum and lilac.

This unit is well suited to homesite development.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated. It is in Loamy Plains range site.

19—Fughes sandy clay loam, 3 to 15 percent slopes. This deep, well drained soil is on foot slopes and benches. It formed in colluvium derived dominantly from shale and siltstone. The native vegetation is mainly grass. Elevation is 7,300 to 8,000 feet. The average annual precipitation is 18 to 22 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 75 to 90 days.

Typically, the surface layer is dark brown sandy clay loam about 5 inches thick. Below this to a depth of 60 inches or more is clay loam and clay. The soil is mildly alkaline throughout.

Included in this unit is about 5 percent Curecanti very cobbly loam on terrace edges and in drainageways. Also included are small areas of Holderness loam under a stand of Gambel oak.

Permeability of this Fughes soil is slow. Available water capacity is high. Effective rooting depth is 40 inches to more than 60 inches. Runoff is rapid, and the hazard of water erosion is high to very high.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture.

The potential plant community on this unit is mainly Arizona fescue, mountain muhly, and Parry oatgrass. Other grasses that characterize the unit are prairie junegrass, Columbia needlegrass, and Letterman needlegrass. The average annual production of air-dry vegetation is about 1,600 pounds per acre. If the condition of the range deteriorates, Kentucky bluegrass, slimstem muhly, blue grama, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for irrigated hay and pasture, the main limitation is the short growing season. The choice of crops is limited mainly to grasses because of the short growing season. Seedbed preparation should be on the contour or across the slope where practical. Irrigation water needs to be applied at a slow rate over a long period to insure that the root zone is properly wetted. Most crops respond to nitrogen and phosphorus fertilizer. If properly managed, this unit can produce 3 tons of irrigated grass hay per acre.

If this unit is used for homesite development, the main limitations are shrink-swell potential and slow permeability. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content

around foundations. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields of conventional size do not function adequately because of the slow permeability of the soil in this unit. Other kinds of sewage disposal systems may be needed.

This map unit is in capability subclass IVe, irrigated and nonirrigated. It is in Loamy Park range site.

20—Gelkie sandy loam, 3 to 15 percent slopes. This deep, well drained soil is on uplands. It formed in colluvium and alluvium derived dominantly from sandstone and siltstone. The native vegetation is mainly grass. Elevation is 8,300 to 9,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 75 days.

Typically, the surface layer is brown sandy loam about 5 inches thick. The subsoil is sandy clay loam about 17 inches thick. The upper 16 inches of the substratum is sandy loam, the next 4 inches is gravelly sandy loam, and the lower part to a depth of 60 inches or more is sandy loam. The soil is neutral to a depth of 22 inches and moderately alkaline below that depth.

Included in this unit is about 20 percent Coutis sandy loam in drainageways.

Permeability of this Gelkie soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate to very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly Arizona fescue, mountain muhly, and Parry oatgrass. Other grasses that characterize the unit are mountain brome, prairie junegrass, and needlegrasses. The average annual production of air-dry vegetation is about 1,600 pounds per acre. If the condition of the range deteriorates, blue grama, slimstem muhly, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condition.

This unit is suited to homesite development. Shrink-swell potential and somewhat restrictive permeability are easily overcome by placing footings of buildings and septic tank absorption fields below the subsoil layer. Absorption fields should be placed on the contour.

This map unit is in capability subclass VIe, nonirrigated. It is in Loamy Park range site.

21—Gelkie sandy loam, 15 to 30 percent slopes. This deep, well drained soil is on uplands. It formed in colluvium derived dominantly from sandstone and siltstone. The native vegetation is mainly grass. Elevation is 8,300 to 9,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 75 days.

Typically, the surface layer is brown sandy loam about 7 inches thick. The subsoil is mainly sandy clay loam about 11 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is neutral to a depth of 13 inches and moderately alkaline below that depth.

Included in this unit is about 20 percent Lymanson cobbly fine sandy loam on the steeper side slopes. The Lymanson soil is underlain by bedrock at a depth of 20 to 40 inches.

Permeability of this Gelkie soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly Arizona fescue, mountain muhly, and Parry oatgrass. Other grasses that characterize the unit are needleandthread, western wheatgrass, and prairie junegrass. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, blue grama, slimstem muhly, pingue, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for homesite development, the main limitation is steepness of slope.

This map unit is in capability subclass VIe, nonirrigated. It is in Loamy Park range site.

22—Glenberg sandy loam. This deep, well drained soil is on flood plains. It formed in stratified sandy alluvium. Slope is 0 to 2 percent. The native vegetation is mainly grasses and a few cottonwood trees. Elevation is 6,000 to 7,000 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 100 to 135 days.

Typically, the surface layer is brown sandy loam about 8 inches thick. The substratum to a depth of 60 inches or more is stratified sandy loam, fine sandy loam, loam, and loamy sand, but its average texture is sandy loam. The soil is moderately alkaline throughout.

Included in this unit is about 10 percent Haverson clay loam.

Permeability of this Glenberg soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. The soil is subject to very brief periods of flooding in spring and early in summer.

Most areas of this unit are used for irrigated hay and pasture. A few areas are used as rangeland.

This unit is well suited to irrigated hay and pasture. Alfalfa and grass mixtures are the main crops. Irrigation water can be applied by corrugations, flooding from contour ditches, and sprinklers. Leveling helps to insure the uniform application of water. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Rotation grazing helps to maintain the quality of forage. Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 4.5 tons of irrigated alfalfa hay per acre.

The potential plant community on this unit is mainly western wheatgrass and Canada wildrye. Other plants that characterize the unit are blue grama, sand dropseed, and cottonwood trees. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, inland saltgrass, rabbitbrush, and forbs increase. Range seeding is suitable if the range is in poor condition.

This unit is poorly suited to homesite development. It is limited mainly by the hazard of flooding.

This map unit is in capability subclasses IIIe, irrigated, and IVe, nonirrigated. It is in Riverbottom range site.

23—Goemmer cobbly clay loam, 20 to 50 percent slopes. This moderately deep, well drained soil is on mountainsides. It formed in residuum and colluvium derived dominantly from clayey shale and siltstone. The native vegetation is mainly Gambel oak. Elevation is 7,500 to 8,500 feet. The average annual precipitation is 22 to 25 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 70 to 100 days.

Typically, the surface layer is weak red cobbly clay loam about 4 inches thick. The upper part of the subsoil is clay loam about 17 inches thick, and the lower part is clay loam about 11 inches thick. Soft siltstone is at a depth of 32 inches. The soil is neutral throughout.

Included in this unit is about 15 percent deep Holderness loam on foot slopes. Also included are small areas of Ring cobbly loam on foot slopes and in drainageways. Igneous rock dikes commonly traverse this unit. Small areas of sandstone Rock outcrop are near the dikes in some places.

Permeability of this Goemmer soil is slow. Available water capacity is moderate to high. Effective rooting depth is 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very high.

This unit is used for livestock grazing and wildlife habitat.

The potential plant community is mainly ponderosa pine and an understory of mountain muhly, Arizona fescue, Parry oatgrass, Gambel oak, and mountainmahogany. The potential production of the native understory vegetation in normal years is about 1,200 pounds of air-dry vegetation per acre. If the condition of the range deteriorates, Gambel oak, pinyon, New Mexico locust, and juniper increase.

This unit is poorly suited to the production of ponderosa pine. Many areas support mainly Gambel oak and a few scattered pine trees.

This unit is poorly suited to homesite development. The main limitations are steepness of slope and shrink-swell potential.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Ponderosa Pine woodland site.

24—Haverson clay loam. This deep, well drained soil is on flood plains and low terraces. It formed in stratified, calcareous alluvium. Slope is 1 to 3 percent. The native vegetation is mainly grass. Elevation is 5,500 to 6,000 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 125 to 155 days.

Typically, the surface layer is light brownish gray clay loam about 8 inches thick. The substratum to a depth of 60 inches or more is stratified clay loam, loam, and sandy loam, but its average texture is loam (fig. 2). The soil is moderately alkaline throughout. It commonly is slightly saline.

Included in this unit is about 10 percent Limon silty clay loam. Also included is about 5 percent Glenberg sandy loam along stream channels.

Permeability of this Haverson soil is moderately slow in the surface layer and moderate in the substratum. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight. The soil is subject to brief periods of flooding early in spring and late in summer.

This unit is used as irrigated cropland and as rangeland. Hay and pasture are the main irrigated crops.

This unit is well suited to irrigated hay and pasture. It is limited mainly by the slight salinity. The toxic salt accumulation in the substratum may restrict the growth of deep-rooted crops such as alfalfa.

Irrigation water can be applied by corrugations and by flooding from contour ditches. For the efficient application and removal of irrigation water, leveling is needed in sloping areas. Subsoiling improves water infiltration and allows salts to be leached downward.

Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 4.5 tons of irrigated grass hay per acre.

The potential plant community on this unit is mainly western wheatgrass and blue grama. Other plants that characterize the unit are fourwing saltbush and vine-mesquite. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, black greasewood, kochia, ring muhly, and curlycup gumweed increase. Range seeding is suitable if the range is in poor condition.

This unit is poorly suited to homesite development. It is limited mainly by the hazard of flooding.

This map unit is in capability subclasses IIe, irrigated, and VIe, nonirrigated. It is in Saline Overflow range site.

25—Holderness loam, 4 to 20 percent slopes. This deep, well drained soil is on foot slopes and benches. It formed in colluvium derived dominantly from shale and siltstone. The native vegetation is mainly Gambel oak

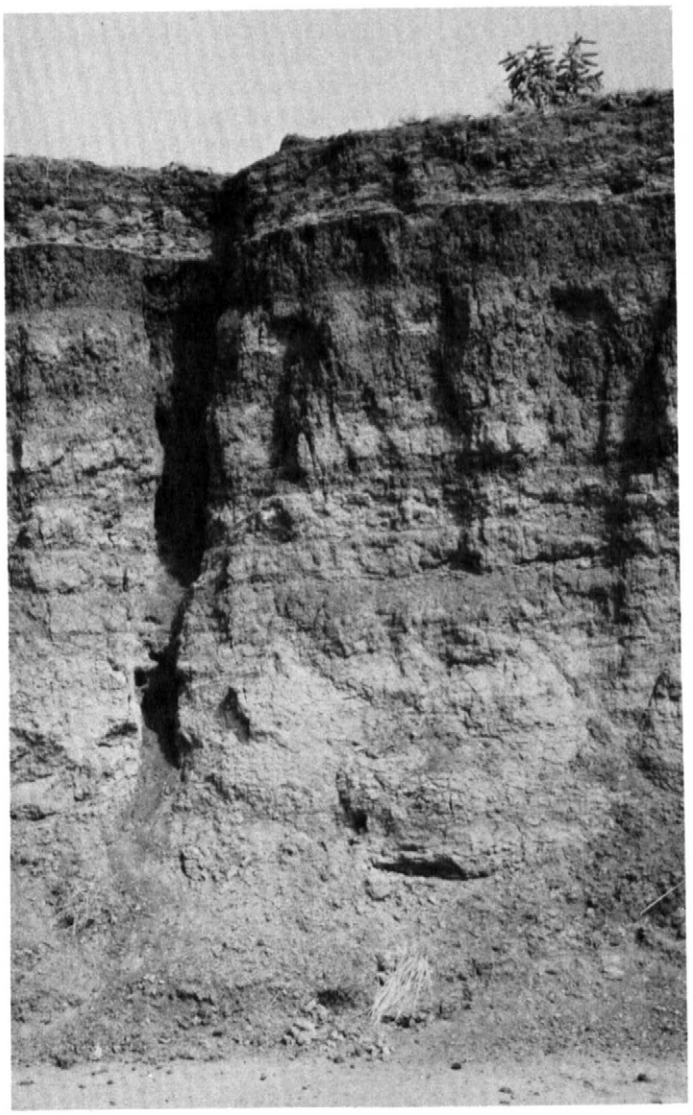


Figure 2.—Profile of Haverson clay loam. Note stratification that is typical of soils on flood plains and low terraces.

brush and grass. Elevation is 7,500 to 8,500 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 75 to 90 days.

Typically, the surface is covered with a layer of partially decomposed oak leaves 2 inches thick. The surface layer is dark grayish brown loam about 8 inches thick. The subsoil is mainly clay about 43 inches thick. Soft, weathered siltstone is at a depth of 51 inches. The soil is neutral to a depth of 4 inches and mildly alkaline below that depth.

Included in this unit is about 10 percent Fughes sandy clay loam in small grassy parks within areas of oak brush. Also included are small areas of Goemmer cobbly clay loam in the steeper areas of the unit.

Permeability of this Holderness soil is slow. Available water capacity is high. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used as rangeland.

The potential plant community is mainly Gambel oak and an understory of Arizona fescue, mountain muhly, and western wheatgrass. The average annual production of air-dry vegetation is about 1,400 pounds per acre. If the condition of the range deteriorates, Gambel oak, Kentucky bluegrass, New Mexico locust, and mulesear wyethia increase.

If this unit is used for homesite development, the main limitation is the shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling. Erosion is a hazard in the steeper areas. Only the part of the site that is used for construction should be disturbed.

Septic tank absorption fields of conventional size do not function adequately because of the slow permeability of the soil. Other kinds of sewage disposal systems may be needed.

This map unit is in capability subclass VIe, nonirrigated. It is in Mountain Clay Loam range site.

26—Kim fine sandy loam, 3 to 9 percent slopes. This deep, well drained soil is on uplands. It formed in eolian silt and fine sand. The native vegetation is mainly grass. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 135 to 165 days.

Typically, the surface layer is brown fine sandy loam 6 inches thick. Below this to a depth of 60 inches or more is loam. The soil is mildly alkaline to a depth of 6 inches and moderately alkaline below that depth.

Included in this unit is about 15 percent Otero fine sandy loam on ridges. Also included are small areas of Travessilla channery sandy loam near areas of Rock outcrop.

Permeability of this Kim soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is high to very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly blue grama and sideoats grama. Other grasses that characterize the unit are Indian ricegrass and western wheatgrass. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, blue grama, sand dropseed, threeawn, snakeweed, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to windbreaks and environmental plantings. The risk of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Chinese elm and Russian-olive. Among the shrubs are honeysuckle and lilac.

This unit is well suited to homesite development. Permeability is somewhat restrictive for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing.

This map unit is in capability subclass VIe, nonirrigated. It is in Loamy Plains range site.

27—Kim-Cascajo complex, 1 to 12 percent slopes. This map unit is on terraces. The native vegetation is mainly grass. Elevation is 6,200 to 7,000 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 125 days.

This unit is about 55 percent Kim loam and about 35 percent Cascajo sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used. They have no definite pattern of occurrence.

Included in this unit is about 10 percent Potts sandy loam in depressional areas.

The Kim soil is deep and well drained. It formed in eolian silt and fine sand. Typically, the surface layer is brown loam about 9 inches thick. Below this to a depth of 60 inches or more is loam. The soil is moderately alkaline throughout.

Permeability of this Kim soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is moderate to very high.

The Cascajo soil is deep and well drained. It formed in coarse textured alluvium. Typically, the surface layer is pale brown gravelly sandy loam about 5 inches thick. The next layer is gravelly loam about 6 inches thick. The upper 9 inches of the substratum is very gravelly sandy loam, and the lower part to a depth of 60 inches or more is very gravelly loamy sand. A layer that has a high content of calcium carbonate is in the substratum. The soil is mildly alkaline to a depth of 5 inches and moderately alkaline below that depth.

Permeability of this Cascajo soil is moderately rapid in the surface layer and rapid in the substratum. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is slight.

This unit is used as rangeland.

The potential plant community on this unit is mainly blue grama, western wheatgrass, and junegrass. Other grasses that characterize the unit are big bluestem, little bluestem, and sideoats grama. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, blue grama, threeawn, pricklypear, and snakeweed increase. Range seeding is suitable if the range is in poor condition. The main limitation for seeding is areas where cobbles are in the surface layer.

This unit is well suited to homesite development.

This map unit is in capability subclass VIe, nonirrigated. It is in Loamy Foothills range site.

28—Lakehelen-Rock outcrop complex, 15 to 80 percent slopes. This map unit is on mountains. The native vegetation is mainly conifers. Elevation is 8,000 to 10,000 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 40 to 60 days.

This unit is about 60 percent Lakehelen fine sandy loam and 30 percent Rock outcrop. Lakehelen soils are on ridgetops and mountainsides, and Rock outcrop is on upper side slopes and ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Leadville fine sandy loam on foot slopes.

The Lakehelen soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface is covered with a mat of partially decomposed needles and twigs about 1 inch thick. The upper part of the surface layer is pinkish gray fine sandy loam about 4 inches thick, and the lower part is light reddish brown fine sandy loam about 8 inches thick. The next layer is very cobbly sandy loam about 4 inches thick. The subsoil is extremely cobbly sandy clay loam about 12 inches thick. Sandstone is at a depth of 28 inches. The soil is slightly acid to a depth of 4 inches, medium acid to a depth of 12 inches, and slightly acid below that depth.

Permeability of the Lakehelen soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is very high.

Rock outcrop consists of long escarpments of sandstone.

This unit is used as woodland and for wildlife habitat and recreation.

The potential plant community is mainly Douglas-fir and white fir and an understory of kinnikinnick, elk sedge, nodding bromegrass, and snowberry. The potential production of the native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre.

The Lakehelen soil is suited to limited production of Douglas-fir. It can produce about 2,100 cubic feet or 6,200 board feet (International rule) of timber per acre from a fully stocked stand of even-aged trees 120 years old.

The main concerns in producing and harvesting timber are steepness of slope, moderate depth to bedrock, and the hazard of erosion. Access to the steeper areas is limited, and conventional harvesting methods generally are restricted to slopes of less than 40 percent. Steepness of slope limits felling, yarding, and road construction.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

Seeding for reforestation generally is limited to the broadcast method because of steepness of slope. Seeding late in fall helps to insure that soil moisture will be adequate for the establishment of seedlings next spring. Suitable seeding mixtures can include Manchar smooth brome, orchardgrass, and pubescent wheatgrass or intermediate wheatgrass.

This unit is poorly suited to homesite development. The main limitations are steepness of slope, depth to bedrock, the high content of cobbles in the soil, and the areas of Rock outcrop.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Douglas-fir woodland site.

29—Larkson stony loam, 5 to 20 percent slopes. This deep, well drained soil is on fans and foot slopes. It formed in alluvium and colluvium derived dominantly from clayey shale. The native vegetation is mainly ponderosa pine. Elevation is 7,000 to 7,800 feet. The average annual precipitation is 21 to 25 inches, the average annual air temperature is 42 to 44 degrees F, and the average frost-free period is 75 to 90 days.

Typically, the surface is covered with a mat of undecomposed pine litter 2 inches thick. The surface layer is grayish brown stony loam 3 inches thick. The subsurface layer is pale brown stony loam 5 inches thick. The next layer is clay loam about 4 inches thick. The subsoil is clay 32 inches thick. The substratum to a depth of 60 inches or more is clay loam. The soil is slightly acid to a depth of 3 inches and neutral below that depth.

Included in this unit is about 10 percent Ring cobbly loam in the steeper areas. Also included are small areas of Morop loam in parks. The Morop soil is very stony in the substratum.

Permeability of this Larkson soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is very high.

Most areas of this unit are used as woodland and for livestock grazing, recreation, and wildlife habitat. A few areas are used for irrigated pasture.

The potential plant community is mainly ponderosa pine and an understory of Gambel oak, snowberry, pine dropseed, and mountain muhly. The potential production of the native understory vegetation in normal years is about 300 pounds of air-dry vegetation per acre.

The site index for ponderosa pine is about 55. This unit can produce about 3,000 cubic feet or 11,900 board feet (International rule) of timber per acre from a fully stocked stand of even-aged trees 100 years old. Pine saplings suitable for transplanting can be obtained on this unit.

Minimizing the risk of erosion is essential in harvesting timber. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

To provide an adequate seedbed for reforestation, the surface should be chiseled or otherwise disturbed. Seeding late in fall helps to insure that soil moisture will be adequate for the establishment of seedlings next spring. Suitable seeding mixtures can include Manchar smooth brome, orchardgrass, wheatgrass, and alfalfa. Planting trees on the contour helps to control erosion.

If this unit is used for hay and pasture, the main limitations are the moderately steep slopes, short growing season, and hazard of erosion. Irrigation water can be applied by corrugations or by flooding from contour ditches. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 3.5 tons of irrigated grass hay per acre.

If this unit is used for homesite development, the main limitations are shrink-swell potential and slow permeability. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields of conventional size do not function adequately because of the slow permeability of the soil. Other kinds of sewage disposal systems may be needed.

This map unit is capability subclass VIe, irrigated and nonirrigated. It is in the Ponderosa Pine woodland site.

30—Leadville fine sandy loam, 25 to 55 percent slopes. This deep, well drained soil is on mountainsides. It formed in colluvium and residuum derived dominantly from sedimentary rock. The native vegetation is mainly coniferous forest. Elevation is 8,000 to 10,000 feet. The average annual precipitation is 20 to 30 inches, the average annual air temperature is 38 to 45 degrees F, and the average frost-free period is 40 to 70 days.

Typically, the surface is covered with a mat of partially decomposed needles and twigs about 2 inches thick. The surface layer is light reddish brown fine sandy loam about 10 inches thick. The upper part of the subsoil is very stony loam about 12 inches thick, and the lower part is extremely stony clay loam about 17 inches thick. Below this to a depth of 60 inches or more is extremely stony sandy loam. The soil is medium acid to a depth of 22 inches and neutral below that depth.

Included in this unit is about 20 percent Lakehelen fine sandy loam on ridges and upper side slopes. Also included are small areas of Uinta fine sandy loam on foot slopes. The Uinta soil has fewer rock fragments in the subsoil and substratum than does this Leadville soil.

Permeability of this Leadville soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is very rapid, and the hazard of water erosion is very high.

This unit is used as woodland and for wildlife habitat and recreation.

The potential plant community is mainly Douglas-fir and white fir and an understory of kinnikinnick, common juniper, Oregon-grape, and elk sedge. The potential production of the native understory vegetation in normal years is about 100 pounds of air-dry vegetation per acre. This unit has very little potential for grazing except in occasional small parks.

The site index for Douglas-fir is about 54. This unit can produce about 3,000 cubic feet or 11,900 board feet (International rule) of timber per acre from a fully stocked stand of even-aged trees 100 years old. The unit is suited to limited production of Christmas trees. This high value crop may be a viable economic alternative to the production of sawtimber.

The main concerns in producing and harvesting timber are steepness of slope and the hazard of erosion. Access to the steeper areas is limited, and conventional harvesting methods generally are restricted to slopes of less than 40 percent. Steepness of slope limits felling, yarding, and road construction.

Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills. Suitable seeding mixtures can include Manchar smooth brome, orchardgrass, and intermediate wheatgrass or pubescent wheatgrass.

This unit is poorly suited to homesite development. The main limitations are steepness of slope and stoniness.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Douglas-fir woodland site.

31—Libeg gravelly sandy loam, 15 to 45 percent slopes. This deep, well drained soil is on steep side slopes along deeply entrenched drainageways. It formed in colluvium. The native vegetation is mainly grass. Elevation is 8,800 to 9,800 feet. The average annual precipitation is 18 to 23 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 50 to 75 days.

Typically, the surface layer is dark gray gravelly sandy loam about 14 inches thick. Below this to a depth of 60 inches or more is very gravelly sandy clay loam. The soil is neutral to a depth of 28 inches and mildly alkaline below that depth.

Included in this unit is about 5 percent Coutis sandy loam in narrow drainageways.

Permeability of this Libeg soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high to very high.

This unit is used as summer rangeland.

The potential plant community on this unit is mainly Arizona fescue, mountain muhly, and Parry oatgrass. The average annual production of air-dry vegetation is about 1,300 pounds per acre. If the condition of the range deteriorates, Kentucky bluegrass, slimstem muhly, blue grama, and fringed sagebrush increase. Range seeding generally is limited to the broadcast method because of the steepness of slope and the areas where cobbles are in the surface layer.

This unit is poorly suited to homesite development. It is limited mainly by steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. It is in Loamy Park range site.

32—Libeg-Coutis complex, 5 to 15 percent slopes. This map unit is on fans and terraces (fig. 3). The native vegetation is mainly grass. Elevation is 8,800 to 9,800 feet. The average annual precipitation is 18 to 23 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 50 to 75 days.

This unit is about 55 percent Libeg gravelly sandy loam and about 45 percent Coutis sandy loam. The Libeg soil is in convex areas and in the steeper areas of the unit, and the Coutis soil is in concave areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

The Libeg soil is deep and well drained. It formed in alluvium and colluvium. The surface layer is dark gray gravelly sandy loam about 14 inches thick. Below this to a depth of 60 inches or more is very gravelly sandy clay loam. The soil is neutral to a depth of 28 inches and mildly alkaline below that depth.

Permeability of the Libeg soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is high to very high.

The Coutis soil is deep and well drained. It formed in alluvium and colluvium. Typically, the surface layer is dark grayish brown sandy loam about 10 inches thick. The next layer is sandy loam about 22 inches thick. The upper 18 inches of the substratum is sandy loam, and the lower part to a depth of 60 inches or more is very gravelly sandy loam. The soil is neutral throughout.

Permeability of the Coutis soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is high to very high.

This unit is used as summer rangeland.

The potential plant community on this unit is mainly Arizona fescue, mountain muhly, and Parry oatgrass. The

Figure 3.—Area of Libeg-Coutis complex, 5 to 15 percent slopes, in foreground.

average annual production of air-dry vegetation is about 1,400 pounds per acre. If the condition of the range deteriorates, Kentucky bluegrass, blue grama, fringed sagebrush, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This unit is suited to homesite development. Cobbles and some stones make excavation difficult over much of the area. Removal of gravel and cobbles in disturbed areas is required for best results when landscaping. Septic tank absorption fields should be placed on the contour. The hazard of erosion is increased if the soil is left exposed during site development.

This map unit is in capability subclass VIe, nonirrigated. It is in Loamy Park range site.

33—Limon silty clay loam, 0 to 2 percent slopes. This deep, well drained soil is on flood plains and alluvial fans. It formed in alluvium derived dominantly from clay shale. The native vegetation is mainly grass. Elevation is 5,600 to 6,500 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 47 to 54 degrees F, and the average frost-free period is 125 to 155 days.

Typically, the surface layer is light brownish gray silty clay loam about 2 inches thick. Below this to a depth of 60 inches or more is silty clay. The soil is moderately alkaline to a depth of 2 inches, strongly alkaline to a depth of 12 inches, and moderately alkaline below that depth. It is slightly saline throughout.

Included in this unit are small areas of Haverson clay loam near river channels. Also included are small areas of slick spots. These spots have a very high concentration of sodium.

Permeability of this Limon soil is slow. The available water capacity is moderate. Irrigated areas generally are less saline. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. Gully erosion occurs in drainageways. The soil is subject to brief periods of flooding May to September.

This unit is used as rangeland and irrigated cropland. Hay and pasture are the main irrigated crops.

The potential plant community on this unit is mainly alkali sacaton and blue grama. Other plants that characterize the unit are western wheatgrass and fourwing saltbush. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, greasewood and inland saltgrass increase. The main limitations for seeding are salinity and the areas where the content of sodium is high.

If this unit is used for irrigated pasture and hay, the main limitation is the slow permeability and salinity of the soil in this unit. In some areas salt-tolerant grasses are best suited to this soil. Where adequate water is available, the content of toxic salts can be reduced by leaching. Water needs to be applied at a slow rate over a long period to insure that the root zone is properly wetted.

Rotation grazing helps to maintain the quality of forage produced on this soil. Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 3 tons of irrigated grass or alfalfa hay per acre.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and the shrinking and swelling of the soil with changes in moisture content.

This map unit is in capability subclasses IIIs, irrigated, and VIs, nonirrigated. It is in Salt Flat range site.

34—Limon clay, 3 to 12 percent slopes. This deep, well drained soil is on fans. It formed in alluvium derived dominantly from clay shale. The native vegetation is mainly grass. Elevation is 6,900 to 7,500 feet. The average annual precipitation is 13 to 16 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is light olive gray clay about 2 inches thick. Below this to a depth of 60 inches or more is clay. The soil is moderately alkaline and slightly saline throughout.

Included in this unit is about 15 percent Razor silty clay on upper foot slopes. The Razor soil is moderately deep over shale.

Permeability of this Limon soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high to very high.

This unit is used mainly as rangeland. It is also used for irrigated hay and pasture. Areas developed for irrigation are used as nonirrigated pasture in years when insufficient irrigation water is available.

The potential plant community on this unit is mainly western wheatgrass and green needlegrass. Other plants that characterize the unit are Indian ricegrass and fourwing saltbush. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, ring muhly, gumweed, greasewood, and wheatgrass increase.

If this unit is used for irrigated pasture and hay, the main limitations are an inadequate supply of irrigation water in some years, salinity, and slow permeability. Irrigation water can be applied by flooding from contour ditches. For the efficient application and removal of irrigation water, leveling is needed in sloping areas. Where adequate water is available, the content of toxic salts can be reduced by leaching.

Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 3 tons of irrigated grass hay per acre.

If this unit is used for homesite development, the main limitations are shrink-swell potential and slow permeability. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields of conventional size do not function adequately because of the slow permeability of the soil. Other kinds of sewage disposal systems may be needed.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated. It is in Clayey Foothills range site.

35—Loberg cobbly loam, 4 to 25 percent slopes. This deep, well drained soil is on mountain foot slopes. It formed in mixed colluvium. The native vegetation is mainly coniferous forest. Elevation is 8,500 to 9,600 feet. The average annual precipitation is 23 to 30 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is 50 to 70 days.

Typically, the surface is covered with a mat of forest litter about 1 inch thick. The surface layer is brown cobbly loam about 3 inches thick. The subsurface layer is light reddish brown cobbly loam about 16 inches thick. The upper 33 inches of the subsoil is very cobbly clay, and the lower part to a depth of 60 inches or more is very cobbly clay loam. The soil is strongly acid to a depth of 3 inches, medium acid to a depth of 19 inches, and neutral below that depth.

Included in this unit are about 10 percent Leadville fine sandy loam in the steeper areas of the unit and about 5 percent Libeg gravelly sandy loam in small parks.

Permeability of this Loberg soil is slow. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is very rapid, and the hazard of water erosion is very high.

This unit is used as woodland and for wildlife habitat and recreation. The value of the unit for livestock grazing is very limited because of the dense overstory.

The potential plant community is mainly Douglas-fir, white fir, and some ponderosa pine and an understory of kinnikinnick, common juniper, nodding bromegrass, and elk sedge. The potential production of the native understory vegetation in normal years is about 150 pounds of air-dry vegetation per acre.

The site index for Douglas-fir is about 56. This unit can produce about 3,100 cubic feet or 13,000 board feet (International rule) of timber per acre from a fully stocked stand of even-aged trees 120 years old. This unit is suited to limited production of Christmas trees. This high value crop may be a viable economic alternative to the production of sawtimber.

Conventional methods of harvesting timber can be used; however, minimizing the risk of erosion is essential. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing.

Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills. Suitable seeding mixtures can include Manchar smooth brome, orchardgrass, and intermediate wheatgrass. To provide an adequate seedbed for reforestation, the surface should be chiseled or otherwise disturbed. Seeding late in fall helps to insure that soil moisture will be adequate for the establishment of seedlings next spring.

If this unit is used for homesite development, the main limitations are slope in the steeper areas and shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields of conventional size do not function adequately because of the slow permeability of the soil. Other kinds of sewage disposal systems may be needed.

This map unit is in capability subclass VIe, nonirrigated. It is in the Douglas-fir woodland site.

36—Louviers-Travessilla complex, 3 to 25 percent slopes. This map unit is on ridges and side slopes of dissected plateaus. The native vegetation is mainly pinyon and juniper. Elevation is 6,300 to 7,500 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 100 to 130 days.

This unit is about 45 percent Louviers very channery clay loam and about 35 percent Travessilla channery sandy loam. The Louviers soil is on side slopes, and the Travessilla soil is on ridgetops. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 15 percent deep Noden loam in drainageways and on foot slopes. Also included are small areas of Rock outcrop of sandstone on the steeper side slopes.

The Louviers soil is shallow and well drained. It formed in residuum derived dominantly from clayey shale. Typically, the surface layer is brown very channery clay loam about 3 inches thick. The next layer is clay loam about 7 inches thick. The substratum is clay loam about 6 inches thick. Soft shale is at a depth of 16 inches. The soil is neutral throughout.

Permeability of the Louviers soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Travessilla soil is shallow and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is light brownish gray channery sandy loam about 6 inches thick. The substratum is channery sandy loam about 9 inches thick. Sandstone is at a depth of 15 inches. The soil is mildly alkaline to a depth of 6 inches and moderately alkaline below that depth.

Permeability of the Travessilla soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is rapid, and the hazard of water erosion is high to very high.

This unit is used as woodland and for livestock grazing.

The potential plant community on this unit is mainly pinyon and juniper and an understory of Indian ricegrass, muttongrass, and sideoats grama. The potential production of the native understory vegetation in normal years is about 600 pounds of air-dry vegetation per acre. Livestock grazing should be managed to protect the unit from excessive erosion.

Woodland products such as firewood, fenceposts, Christmas trees, and pinyon nuts are available on this unit. Mature stands of trees can produce 6 to 8 cords of firewood per acre if all trees are removed. Removing standing dead trees and harvesting the green overstory generally enhance reproduction and promote the growth of grass and younger trees. Leaving high juniper stumps with several small live branches promotes the growth of fencepost crop.

This unit is poorly suited to homesite development. The main limitations on the side slopes are shallow depth to shale, shrink-swell potential, and steepness of slope. The main limitation on the ridgetops is shallow depth to sandstone.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Pinyon-Juniper woodland site.

37—Louviers-Travessilla-Rock outcrop complex, 25 to 85 percent slopes. This map unit is on side

slopes of dissected plateaus. The native vegetation is mainly pinyon and juniper. Elevation is 6,300 to 7,500 feet. The average annual precipitation is 14 to 16 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 100 to 130 days.

This unit is about 40 percent Louviers very channery clay loam, about 35 percent Travessilla channery sandy loam, and about 20 percent Rock outcrop. The Louviers soil is on the lower side slopes, and the Travessilla soil is on the upper side slopes. Rock outcrop is mainly on the upper side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent deep Kim loam in drainageways and on foot slopes.

The Louviers soil is shallow and well drained. It formed in residuum derived dominantly from clayey shale. Typically, the surface layer is brown very channery clay loam about 3 inches thick. The next layer is clay loam about 7 inches thick. The substratum is clay loam about 6 inches thick. Soft shale is at a depth of 16 inches. The soil is neutral throughout.

Permeability of the Louviers soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Travessilla soil is shallow and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is light brownish gray channery sandy loam about 6 inches thick. The substratum is channery sandy loam about 9 inches thick. Sandstone is at a depth of 15 inches. The soil is mildly alkaline to a depth of 6 inches and moderately alkaline below that depth.

Permeability of the Travessilla soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

Rock outcrop consists of barren sandstone ledges.

This unit is used as woodland and for livestock grazing.

The potential plant community on this unit is mainly pinyon and juniper and an understory of Indian ricegrass, muttongrass, and little bluestem. The potential production of the native understory vegetation in normal years is about 400 pounds of air-dry vegetation per acre. Slope limits access by livestock and results in overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock to graze in areas where access is limited. Mechanical treatment is not practical, because the surface is stony and slopes are steep.

Woodland products such as firewood, fenceposts, Christmas trees, and pinyon nuts are available in some areas of this unit. Mature stands of trees can produce 6 to 8 cords of firewood per acre if all trees are removed. Only the foot slopes and ridges generally are accessible because of steepness of slope, which limits the harvesting of trees.

This unit is poorly suited to homesite development. On the lower side slopes, the main limitations are shallow depth to shale, shrink-swell potential, and steepness of slope. On the upper side slopes, the main limitations are shallow depth to sandstone and steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Pinyon-Juniper woodland site.

38—Lymanson cobbly fine sandy loam, 20 to 40 percent slopes. This moderately deep, well drained soil is on mountainsides. It formed in colluvium derived dominantly from conglomeritic tuff. The native vegetation is mainly ponderosa pine. Elevation is 8,500 to 9,000 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 55 to 75 days.

Typically, the surface layer is grayish brown cobbly fine sandy loam about 3 inches thick. The subsoil and substratum are gravelly sandy clay loam about 26 inches thick. Conglomeritic tuff is at a depth of 29 inches. The soil is neutral to a depth of 12 inches and moderately alkaline below that depth.

Included in this unit are about 5 percent Rock outcrop, which occurs as narrow bands, and 5 percent gravelly sandy loam on ridgetops. Also included are small areas of a deep sandy loam in drainageways and on foot slopes.

Permeability of this Lymanson soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used for livestock grazing, woodland, and wildlife habitat.

The potential plant community is mainly ponderosa pine and an understory of Arizona fescue, mountain muhly, and pine dropseed. The potential production of the native understory vegetation in normal years is about 1,200 pounds of air-dry vegetation per acre. Range seeding generally is limited to the broadcast method because of steepness of slope.

This unit is poorly suited to the production of ponderosa pine. The ponderosa pine trees are scattered, and the site index for this species is very low.

This unit is poorly suited to homesite development. It is limited mainly by steepness of slope.

This map unit is in capability subclass VIIe. It is in the Ponderosa Pine woodland site.

39—Maitland fine sandy loam, 1 to 15 percent slopes. This deep, well drained soil is on uplands and foot slopes. It formed in colluvium derived dominantly from sandstone and shale. The native vegetation is mainly ponderosa pine. Elevation is 7,000 to 8,000 feet. The average annual precipitation is 18 to 23 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 75 to 100 days.

Typically, the surface is covered with a mat of partially decomposed twigs and needles about 1 inch thick. The

surface layer is grayish brown fine sandy loam about 5 inches thick. The subsurface layer is pinkish gray fine sandy loam about 5 inches thick. The next layer is sandy clay loam about 4 inches thick. The subsoil is sandy clay loam about 31 inches thick. The substratum to a depth of 60 inches or more is sandy clay loam. The soil is slightly acid throughout.

Included in this unit is about 15 percent moderately deep Bayerton cobbly sandy loam in the steeper areas of the unit. Also included are small areas of Ring cobbly sandy loam and Trag loam along drainageways.

Permeability of this Maitland soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is slight to very high, depending on slope.

This unit is used as woodland and for livestock grazing and wildlife habitat.

The potential plant community is mainly ponderosa pine and an understory of Gambel oak, mountainmahogany, Arizona fescue, mountain muhly, and elk sedge. The potential production of the native understory vegetation in normal years is about 500 pounds of air-dry vegetation per acre. If the condition of the range deteriorates, Kentucky bluegrass, Gambel oak, and elk sedge increase. Livestock grazing should be managed to protect the soil from excessive erosion.

This unit is suited to the limited production of ponderosa pine. On the basis of a site index of 60, the potential production per acre of timber is 3,600 cubic feet or 14,600 board feet (International rule, one-eighth inch kerf) from an even-aged, fully stocked stand of trees 100 years old. Conventional methods of harvesting timber can be used.

This unit can provide ornamental ponderosa pine for transplanting. Because the content of rock fragments in the soil is low, tree spades should work well.

Minimizing the risk of erosion is essential in harvesting timber. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing.

Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills. Suitable seeding mixtures can include Manchar smooth brome, orchardgrass, and pubescent wheatgrass or intermediate wheatgrass. To provide an adequate seedbed, the surface should be chiseled or otherwise disturbed. Seeding late in fall helps to insure that soil moisture will be adequate for the establishment of seedlings next spring.

This unit is suited to homesite development. Shrink-swell potential can be overcome by thoroughly prewetting foundation areas. Permeability is somewhat restrictive for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field. Absorption fields should be placed on the contour.

This map unit is in capability subclass VIe, nonirrigated. It is in the Ponderosa Pine woodland site.

40—Manvel silty clay loam, 1 to 5 percent slopes. This deep, well drained soil is on foot slopes and uplands. It formed in residuum and colluvium derived dominantly from limestone and shale. The native vegetation is mainly grass. Elevation is 5,500 to 6,300 feet. The average annual precipitation is 14 to 15 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 120 to 140 days.

Typically, the surface layer is pale brown silty clay loam about 5 inches thick. The next layer is silty clay loam about 11 inches thick. The upper part of the substratum is silty clay loam about 6 inches thick. The lower part to a depth of 60 inches or more is silt loam. The soil is moderately alkaline.

Included in this unit is about 15 percent moderately deep Minnequa loam in the steeper areas of the unit. Also included are small areas of Limon silty clay loam along drainageways.

Permeability of this Manvel soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is moderate to high.

This unit is used as nonirrigated cropland and rangeland. Wheat is the main nonirrigated crop.

In areas of nonirrigated cropland, control of soil blowing and conservation of moisture are important concerns. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Soil blowing can be reduced by planting crops in alternate strips at right angles to the prevailing wind. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. On long slopes, chiseling the stubble in fall slows runoff and reduces loss of moisture in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. With good management, this unit can produce 12 bushels per acre of wheat grown in a wheat-fallow cropping system.

The potential plant community on this unit is mainly western wheatgrass and blue grama. Other grasses that characterize the unit are Indian ricegrass, needleandthread, and sideoats grama. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, ring muhly, threeawn, snakeweed, pricklypear, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to windbreaks and environmental plantings. The risk of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive, Chinese elm, and Rocky Mountain juniper. Among the shrubs are lilac and plum.

This unit is suited to homesite development. Shrink-swell potential can be minimized by thoroughly prewetting foundation areas. Restrictive permeability for septic tank absorption fields can be overcome by increasing the size of the absorption field. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing.

This map unit is in capability subclass IVe, nonirrigated. It is in Loamy Foothills range site.

41—Manvel silty clay loam, saline, 1 to 5 percent slopes. This deep, well drained soil is on foot slopes, mainly along upland drainageways (fig. 4). It formed in colluvium derived dominantly from limestone and shale. The native vegetation is mainly grass. Elevation is 5,500 to 6,600 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 125 to 160 days.

Typically, the surface layer is brown silty clay loam about 3 inches thick. Below this to a depth of 60 inches or more is silty clay loam. Shale underlies much of the area between depths of 5 and 12 feet. Water perched on the shale creates moist and strongly saline spots. The soil is moderately alkaline to a depth of 14 inches and strongly alkaline below that depth. It is moderately saline below a depth of 3 inches.

Included in this unit is about 15 percent Otero sandy loam on low hummocks and ridges. Also included are small areas of Limon silty clay loam and Apishapa silty clay along drainageways.

Permeability of this Manvel soil is moderately slow. The available water capacity is limited by salinity. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is high.

This unit is used as rangeland.

The potential plant community on this unit is mainly alkali sacaton and blue grama. Other plants that characterize the unit are western wheatgrass and fourwing saltbush. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, greasewood and inland saltgrass increase. The main limitations for seeding are salinity and gullies.

If this unit is used for windbreaks and environmental plantings, the main limitation is salinity. Only trees and shrubs that tolerate salinity should be planted.

If this unit is used for homesite development, corrosivity to concrete and steel is the main limitation. Shrink-swell potential can be minimized by thoroughly prewetting foundation areas. Restrictive permeability for

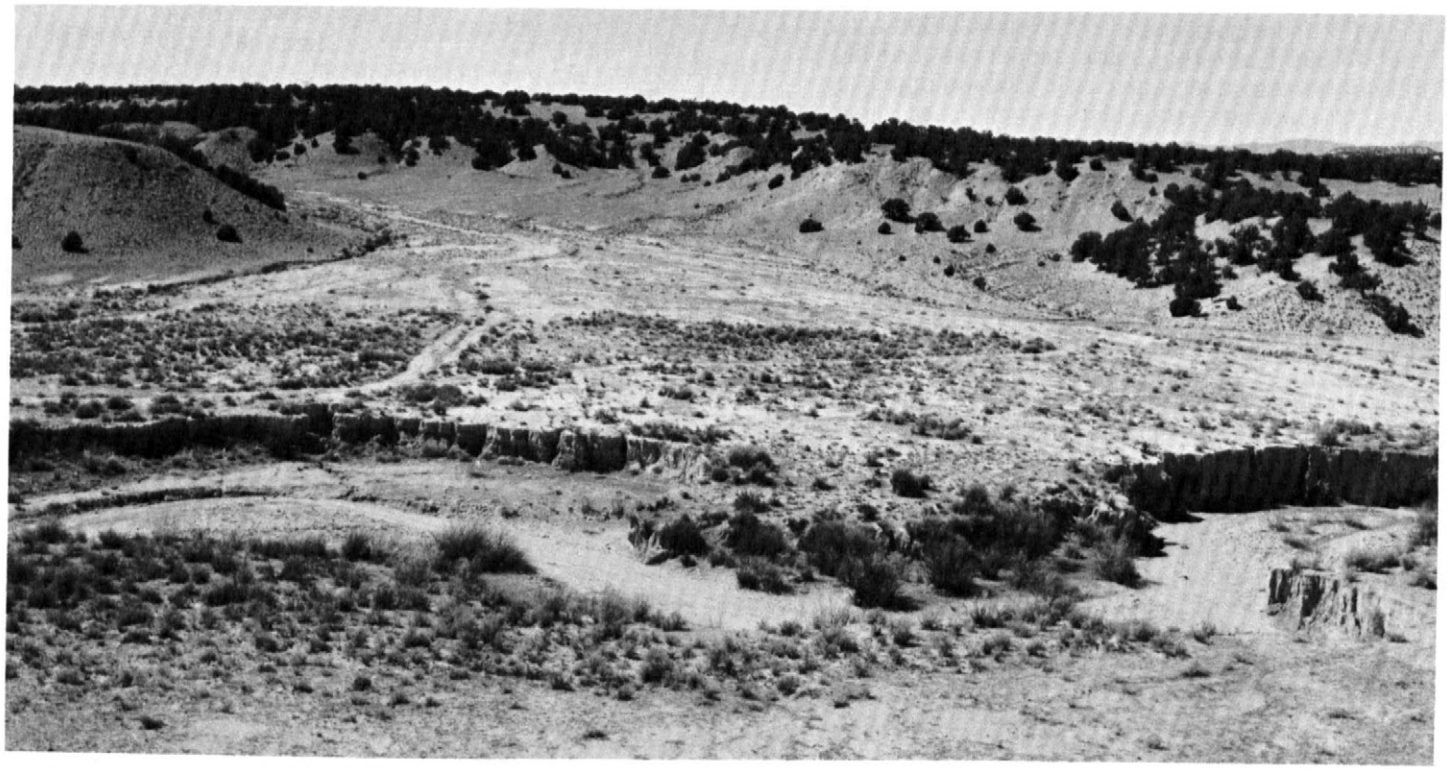


Figure 4.—Area of Manvel silty clay loam, saline, 1 to 5 percent slopes.

septic tank absorption fields can be overcome by increasing the size of the absorption field. In places, water perched on the underlying shale is a concern for basements or other deep excavations.

This map unit is in capability subclass VIe, nonirrigated. It is in Salt Flat range site.

42—Manvel-Minnequa loams, 1 to 5 percent slopes. This map unit is on uplands. The native vegetation is mainly grass. Elevation is 5,500 to 6,200 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 49 to 54 degrees F, and the average frost-free period is 130 to 165 days.

This unit is about 70 percent Manvel loam and about 25 percent Minnequa loam. The Manvel soil is in the less sloping areas of the unit, and the Minnequa soil is in the more sloping, convex areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent Manzanola clay loam in narrow drainageways.

The Manvel soil is deep and well drained. It formed in residuum and colluvium derived dominantly from interbedded limestone and shale. Typically, the surface layer is pale brown loam about 3 inches thick. Below this to a depth of 60 inches or more is silt loam. The soil is moderately alkaline throughout.

Permeability of the Manvel soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight to moderate.

The Minnequa soil is moderately deep and well drained. It formed in residuum and locally transported sediment derived dominantly from interbedded limestone and shale. Typically, the surface layer is light brownish gray loam about 6 inches thick. The next layer is silt loam about 15 inches thick. The substratum is silt loam about 12 inches thick. Chalky limestone is at a depth of about 33 inches. The soil is moderately alkaline throughout.

Permeability of the Minnequa soil is moderate. Available water capacity is low to moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is slight to high.

Most areas of this unit are used as rangeland. A few areas are used as nonirrigated cropland. Areas of nonirrigated cropland are highly susceptible to water erosion and soil blowing and generally should be reseeded to grass.

The potential plant community on this unit is mainly blue grama and western wheatgrass. Other grasses that characterize the unit are Indian ricegrass and sideoats grama. The average annual production of air-dry vegetation is about 750 pounds per acre. If the condition of the range deteriorates, ring muhly, threeawn, sand dropseed, and snakeweed increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to windbreaks and environmental planting. The hazard of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and Rocky Mountain juniper. Among the shrubs are lilac and plum.

This unit is suited to homesite development. Cuts needed to provide essentially level building sites can expose bedrock. If the density of housing is moderate to high, effluent from absorption fields can surface downslope and create a hazard to health. Shrink-swell potential can be minimized by thoroughly prewetting the foundation area.

This map unit is in capability subclass VIe, nonirrigated. It is in Loamy Plains range site.

43—Manzano loam. This deep, well drained soil is on stream terraces and flood plains. It formed in alluvium. Slope is 0 to 3 percent. The native vegetation is mainly grass. Elevation is 6,200 to 7,500 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 45 to 50 degrees F, and the average frost-free period is 100 to 130 days.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is loam about 17 inches thick. The upper part of the substratum is loam about 12 inches thick, and the lower part to a depth of 60 inches or more is fine sandy loam. The soil is neutral to a depth of 3 inches, mildly alkaline to a depth of 15 inches, and moderately alkaline below that depth.

Included in this unit is about 10 percent Glenberg sandy loam near stream channels. Also included are small areas of Nunn loam at the base of fans sloping down toward flood plains.

Permeability of this Manzano soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The soil is subject to very brief periods of flooding in spring and early in summer. A seasonal high water table is at a depth of 6 to 10 feet during most of the year.

Most areas of this unit are used for irrigated hay and pasture. A few areas are used as rangeland. Alfalfa and grass mixtures are the principal irrigated crops.

This unit is well suited to irrigated hay and pasture. Irrigation water can be applied by corrugations and by flooding from contour ditches. Leveling helps to insure the uniform application of water. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 3.5 tons of irrigated alfalfa hay per acre.

The potential plant community on this unit is mainly western wheatgrass and needlegrass. Other grasses that characterize the unit are Indian ricegrass and sideoats grama. The average annual production of air-dry vegetation is about 1,300 pounds per acre. If the condition of the range deteriorates, sleepygrass, threeawn, rabbitbrush, and snakegrass increase. Range seeding is suitable if the range is in poor condtion.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive, cottonwood, and golden willow. Among the shrubs are honeysuckle and caragana.

This unit is poorly suited to homesite development. It is limited mainly by a hazard of flooding if unprotected.

This map unit is in capability subclasses IIIc, irrigated, and IVc, nonirrigated. It is in Loamy Foothills range site.

44—Manzanola clay loam, 0 to 2 percent slopes. This deep, well drained soil is on terraces and fans. It formed in calcareous alluvium derived dominantly from shale. The native vegetation is mainly grass. Elevation is 5,500 to 6,300 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 49 to 54 degrees F, and the average frost-free period is 125 to 165 days.

Typically, the surface layer is light brownish gray clay loam about 4 inches thick. The subsoil is silty clay loam about 26 inches thick. The substratum to a depth of 60 inches or more is silty clay loam. The soil is mildly alkaline to a depth of 7 inches and moderately alkaline below that depth.

Permeability of this Manzanola soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight.

This unit is used mainly as rangeland. It is also used as irrigated cropland. Hay and pasture are the main irrigated crops.

The potential plant community on this unit is mainly western wheatgrass and blue grama. Other plants that characterize the unit are fourwing saltbush and vine-mesquite. The average annual production of air-dry vegetation is about 1,800 pounds per acre. If the condition of the range deteriorates, kochia, curlcup gumweed, and ring muhly increase. Range seeding is suitable if the range is in poor condtion.

This unit is well suited to irrigated hay and pasture. It is limited mainly by the slow permeability of the subsoil. Water needs to be applied at a slow rate over a long period of time to insure that the root zone is properly wetted.

Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 4 tons of irrigated alfalfa hay per acre.

If this unit is used for windbreaks and environmental plantings, the main limitations are slow permeability and the droughtiness of the soil. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and Rocky Mountain juniper. Among the shrubs are lilac and plum.

If this unit is used for homesite development, the main limitation is shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields of conventional size do not function adequately because of the slow permeability of the soil. Other kinds of sewage disposal systems may be needed.

This map unit is in capability subclasses IIIs, irrigated, and VIe, nonirrigated. It is in Saline Overflow range site.

45—Manzanola clay loam, 2 to 5 percent slopes. This deep, well drained soil is on uplands and fans. It formed in alluvium and residuum derived dominantly from shale. The native vegetation is mainly grass. Elevation is 5,500 to 6,400 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 49 to 54 degrees F, and the average frost-free period is 125 to 165 days.

Typically, the surface layer is light brownish gray clay loam about 3 inches thick. The subsoil is silty clay loam about 29 inches thick. The substratum to a depth of 60 inches or more is silty clay loam. The soil is mildly alkaline to a depth of 3 inches and moderately alkaline below that depth.

Permeability of this Manzanola soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is moderate to high.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture.

The potential plant community on this unit is mainly western wheatgrass and blue grama. Other plants that characterize the unit are fourwing saltbush and sideoats grama. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, ring muhly, snakeweed, cholla, and pricklypear increase. Range seeding is suitable if the range is in poor condtion.

If this unit is used for irrigated hay and pasture, the main limitations are slow permeability and the hazard of erosion. Water needs to be applied at a slow rate over a long period to insure that the root zone is properly wetted. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 3.5 tons of irrigated alfalfa hay per acre.

If this unit is used for windbreaks and environmental plantings, the main limitations are slow permeability and low precipitation. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and Rocky Mountain juniper. Among the shrubs are lilac and plum.

If this unit is used for homesite development, the main limitation is shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields of conventional size do not function adequately because of the slow permeability of the soil. Other kinds of sewage disposal systems may be needed.

This map unit is in capability subclasses IIIe, irrigated, and VIe, nonirrigated. It is in Loamy Plains range site.

46—Midway clay, 3 to 20 percent slopes. This shallow, well drained soil is on upland ridges and side slopes. It formed in residuum derived dominantly from shale. The native vegetation is mainly grass. Elevation is 5,500 to 6,500 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 125 to 165 days.

Typically, the surface layer is light brownish gray clay about 4 inches thick. The next layer is clay about 6 inches thick. The substratum is clay about 4 inches thick. Platy shale is at a depth of 14 inches. The soil is moderately alkaline and slightly saline throughout.

Permeability of this Midway soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly alkali sacaton and western wheatgrass. Other grasses that characterize the unit are sideoats grama and blue grama. The average annual production of air-dry vegetation is about 550 pounds per acre. If the condition of the range deteriorates, galleta, threeawn, black greasewood, and snakeweed increase. Livestock grazing should be managed to protect the soil from excessive erosion.

This unit is poorly suited to windbreaks and environmental plantings. The main limitations are shallow depth to shale, steepness of slope, and droughtiness.

This unit is poorly suited to homesite development. It is limited mainly by shrink-swell potential.

This map unit is in capability subclass VIe, nonirrigated. It is in Shaly Plains range site.

47—Minnequa-Otero sandy loams, 2 to 12 percent slopes. This map unit is on uplands. The native vegetation is mainly grass. Elevation is 5,500 to 6,000 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 49 to 53 degrees F, and the average frost-free period is 130 to 160 days.

This unit is about 50 percent Minnequa sandy loam and about 40 percent Otero sandy loam. The Minnequa soil is in the more nearly level areas of the unit, and the Otero soil is on ridges and in narrow drainageways. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Kim fine sandy loam on ridges and in narrow drainageways. Also included are small areas of limestone Rock outcrop in the steeper areas.

The Minnequa soil is moderately deep and well drained. It formed in residuum and locally transported sediment derived dominantly from interbedded limestone and shale. Typically, the surface layer is light brownish gray sandy loam about 10 inches thick. Below this is silt loam about 23 inches thick. Fractured limestone is at a depth of 33 inches. The soil is moderately alkaline throughout.

Permeability of the Minnequa soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate to high.

The Otero soil is deep and somewhat excessively drained. It formed in eolian fine sand. Typically, the surface layer is light brownish gray sandy loam about 6 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is mildly alkaline to a depth of 6 inches and moderately alkaline below that depth.

Permeability of the Otero soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate to very high. The hazard of soil blowing is high.

This unit is used as rangeland. Nonirrigated farming has been attempted in a few areas, but the land has been reseeded to grass because of droughtiness and the high hazard of soil blowing when the unit is cultivated.

The potential plant community on this unit is mainly blue grama and sideoats grama. Other grasses that characterize the unit are needleandthread and Indian ricegrass. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, threeawn, yucca, snakeweed, and sand dropseed increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for windbreaks and environmental planting, the main limitations are limited rooting depth in areas of the Minnequa soil, the high hazard of soil blowing on the Otero soil, and limited available water capacity. The risk of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Among the trees that are

suitable for planting are Russian-olive and Rocky Mountain juniper. Among the shrubs are caragana and lilac.

This unit is well suited to homesite development. Houses with basements may need to have drains installed around the footings if basement floors rest on bedrock.

This map unit is in capability subclass VIe, nonirrigated. It is in Sandy Plains range site.

48—Montez-Rogert complex, 15 to 65 percent slopes. This map unit is on mountain ridges and side slopes. The native vegetation is mainly conifers. Elevation is 9,000 to 10,000 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 40 to 70 days.

This unit is about 55 percent Montez sandy loam and 30 percent Rogert gravelly sandy loam. The Montez soil is on steep side slopes, and the Rogert soil is on ridges and side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Breece sandy loam in drainageways. Also included are small areas of granite Rock outcrop on ridges and upper side slopes.

The Montez soil is deep and well drained. It formed in colluvium derived dominantly from granite. Typically, the surface is covered with a mat of undecomposed and partially decomposed litter about 2 inches thick. The surface layer is dark grayish brown sandy loam about 7 inches thick. The subsurface layer is mainly light brownish gray loamy sand about 15 inches thick. The next layer is sandy loam about 6 inches thick. The subsoil is gravelly sandy clay loam about 13 inches thick. The substratum is very gravelly loamy sand about 9 inches thick. Granite is at a depth of about 50 inches. The soil is neutral to a depth of 36 inches, slightly acid to a depth of 41 inches, and mildly alkaline below that depth.

Permeability of the Montez soil is moderate. Available water capacity is low. Effective rooting depth is 40 to 60 inches. Runoff is rapid, and the hazard of water erosion is very high.

The Rogert soil is shallow and well drained. It formed in residuum derived dominantly from granite. Typically, the surface layer is grayish brown gravelly sandy loam about 7 inches thick. Below this is very gravelly sandy loam about 7 inches thick. Granite is at a depth of 14 inches. The soil is neutral throughout.

Permeability of the Rogert soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used as woodland and for livestock grazing, recreation, and wildlife habitat.

The potential plant community on the Montez soil is mainly Douglas-fir and some white fir and ponderosa pine and an understory of common juniper, kinnikinnick, Arizona fescue, and nodding bromegrass. The potential production of native understory vegetation is about 200 pounds of air-dry vegetation per acre.

The potential plant community on the Rogert soil is an open stand of ponderosa pine and an understory of Arizona fescue, mountain muhly, and pine dropseed. The potential production of native understory vegetation is about 400 pounds of air-dry vegetation per acre.

Slope limits access by livestock and results in overgrazing of the less sloping areas of this unit.

The Montez soil is suited to the limited production of Douglas-fir and white fir. The site index is about 55 for Douglas-fir and about 40 for white fir. This soil can produce about 3,000 cubic feet or 11,900 board feet (International rule) of timber per acre from a fully stocked stand of even-aged trees 100 years old.

Because of fire, many areas are currently forested with aspen of low site quality. These areas commonly have an understory of white fir with the potential to produce limited crops of Christmas trees and trees for transplanting. Access to the steeper areas is limited, and conventional harvest methods generally are restricted to slopes of less than 40 percent.

Minimizing the risk of erosion is essential in harvesting timber. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills.

Suitable seeding mixtures can include Arizona fescue, pubescent wheatgrass, western wheatgrass, and yellow sweetclover. To provide an adequate seedbed, the surface should be chiseled or otherwise disturbed. Seeding late in fall helps to insure that soil moisture will be adequate for the establishment of seedlings next spring.

This unit is poorly suited to homesite development. The main limitations are steepness of slope and, in areas of the Rogert soil, shallow depth to hard bedrock.

This map unit is in capability subclass VIIe, nonirrigated. It is in the Douglas-fir woodland site.

49—Morop loam, 2 to 18 percent slopes. This deep, well drained soil is on terraces. It formed in alluvium. The native vegetation is mainly grass. Elevation is 7,000 to 8,000 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 75 to 100 days.

Typically, the surface layer is grayish brown loam about 7 inches thick. The upper part of the subsoil is mainly clay loam and clay about 23 inches thick, and the lower part is very stony clay about 10 inches thick. The substratum to a depth of 60 inches or more is very stony clay loam, and it has a high content of accumulated calcium carbonate. The soil is neutral to a depth of 30

inches, mildly alkaline to a depth of 40 inches, and moderately alkaline below that depth.

Included in this unit is about 5 percent Breece sandy loam in narrow drainageways. Also included are areas where cobbles are on the surface.

Permeability of this Morop soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is high to very high.

Most areas of this unit are used as rangeland. A few areas are used as irrigated and nonirrigated cropland. Hay and pasture are the main irrigated crops. Small grain such as oats and barley is the main nonirrigated crop. Some areas were farmed in the past but have been reseeded to grass. The steeper areas of this unit are not suited to cultivation.

The potential plant community on this unit is mainly western wheatgrass, blue grama, needleandthread, and Indian ricegrass. The average annual production of air-dry vegetation is about 1,300 pounds per acre. If the condition of the range deteriorates, sand dropseed, threeawn, snakeweed, and sleepygrass increase. Range seeding is suitable if the range is in poor condtion.

The more gently sloping areas of this unit are well suited to irrigated pasture and hay. The choice of crops is limited to grasses because of the short growing season. Irrigation water can be applied by corrugations and by flooding from contour ditches. Leveling helps to insure the uniform application of water. Because stones are in the substratum of the soil in this unit, onsite investigation may be needed before leveling. If properly managed, this unit can produce 3 tons of irrigated grass hay per acre.

This unit is well suited to windbreaks and environmental planting. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are ponderosa pine, Rocky Mountain juniper, and Russian-olive. Among the shrubs are skunkbush sumac and lilac.

If this unit is used for homesite development, the main limitation is the shrink-swell potential of the subsoil. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields of conventional size do not function adequately, because of the slow permeability of the soil. Other kinds of sewage disposal systems may be needed.

This map unit is in capability subclass IVe, irrigated and nonirrigated. It is in Loamy Foothills range site.

50—Neville fine sandy loam, 1 to 3 percent slopes. This deep, well drained soil is on uplands and in drainageways. It formed in alluvium derived dominantly from sandstone, siltstone, and shale. The native vegetation is mainly grass. Elevation is 6,700 to 7,500 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is reddish brown fine sandy loam about 5 inches thick. Below this to a depth of 60 inches or more is loam. The soil is moderately alkaline throughout.

Included in this unit is about 10 percent Otero fine sandy loam on low ridges.

Permeability of this Neville soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

This unit is used as rangeland and for irrigated pasture and hay.

The potential plant community on this unit is mainly western wheatgrass, blue grama, and Indian ricegrass. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, sleepygrass, threeawn, rabbitbrush, and snakeweed increase. Much of the range is in poor condition because of overgrazing. Range seeding is suitable where the range is in poor condtion.

This unit is well suited to irrigated hay and pasture. Irrigation water can be applied by corrugations and by flooding from contour ditches. For the efficient application and removal of irrigation water, leveling is needed. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

Nonleguminous crops on this unit respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. Rotation grazing helps to maintain the quality of forage. If properly managed, this unit can produce 3.5 tons of irrigated alfalfa hay per acre.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and Rocky Mountain juniper. Among the shrubs are skunkbush sumac and lilac.

This unit is well suited to homesite development. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing. Structures to divert runoff from higher lying areas may be needed to reduce erosion.

This map unit is in capability subclasses IIIc, irrigated, and VIe, nonirrigated. It is in Loamy Foothills range site.

51—Neville fine sandy loam, 3 to 9 percent slopes. This deep, well drained soil is on foot slopes and uplands. It formed in alluvium and colluvium derived dominantly from sandstone, siltstone, and shale. The native vegetation is mainly grass. Elevation is 6,700 to 7,500 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is reddish brown fine sandy loam about 5 inches thick. Below this to a depth of 60 inches or more is loam. The soil is moderately alkaline throughout.

Included in this unit is about 20 percent Otero fine sandy loam in drainageways.

Permeability of this Neville soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is high to very high.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture.

The potential plant community on this unit is mainly western wheatgrass, blue grama, and sideoats grama. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, sleepygrass, threeawn, snakeweed, and rabbitbrush increase. Range seeding is suitable if the range is in poor condtion.

This unit is well suited to irrigated hay and pasture. Irrigation water can be applied by corrugations and by flooding from contour ditches. Water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Seeded preparation should be on the contour or across the slope where practical.

Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 3.5 tons of irrigated alfalfa hay per acre.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and Rocky Mountain juniper. Among the shrubs are skunkbush sumac and lilac.

This unit is well suited to homesite development. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated. It is in Loamy Foothills range site.

52—Noden sandy loam, 1 to 8 percent slopes. This deep, well drained soil is on uplands and foot slopes. It formed in eolian and colluvial material derived dominantly from sandstone. The native vegetation is mainly grass. Elevation is 6,200 to 7,300 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 100 to 125 days.

Typically, the surface layer is dark grayish brown sandy loam about 10 inches thick. The subsoil is sandy clay loam about 20 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is neutral to a depth of 30 inches and mildly alkaline below that depth.

Included in this unit are small areas of soils, on knolls, that are similar to this Noden soil but are 20 to 40 inches deep to bedrock.

Permeability of this Noden soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used as rangeland. A few areas are used for irrigated and nonirrigated crops. Hay and pasture are the main irrigated crops. Wheat is the main nonirrigated crop.

The potential plant community on this unit is mainly big bluestem, little bluestem, and blue grama. Other grasses that characterize the unit are sideoats grama, needleandthread, and western wheatgrass. The average annual production of air-dry vegetation is about 1,500 pounds per acre. If the condition of the range deteriorates, blue grama, threeawn, sleepygrass, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condtion.

This unit is well suited to irrigated hay and pasture. Hay commonly is drilled into oat stubble in spring or fall. The oat stubble is used as a ground cover.

Irrigation water can be applied by corrugations and by flooding from contour ditches. Leveling helps to insure the uniform application of water. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion.

Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 3.5 tons of irrigated alfalfa hay per acre.

In areas of nonirrigated cropland, control of soil blowing and conservation of moisture are important concerns. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Soil blowing can be reduced by planting crops in alternate strips at right angles to the prevailing wind. On long slopes, chiseling the stubble in fall slows runoff and reduces loss of moisture in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration.

With good management, this unit can produce 22 bushels per acre of wheat grown in a wheat-fallow cropping system.

This unit is well suited to windbreaks and environmental plantings. The risk of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are ponderosa pine and Rocky Mountain juniper. Among the shrubs are lilac and plum.

This unit is well suited to homesite development. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing.

This map unit is in capability subclass IVe, irrigated and nonirrigated. It is in Sandy Foothills range site.

53—Noden sandy loam, 8 to 15 percent slopes. This deep, well drained soil is on uplands and foot slopes. It formed in eolian and colluvial material derived dominantly from sandstone. The native vegetation is mainly grass. Elevation is 6,200 to 7,300 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 100 to 125 days.

Typically, the surface layer is dark grayish brown sandy loam about 10 inches thick. The subsoil is sandy clay loam about 20 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is neutral to a depth of 30 inches and mildly alkaline below that depth.

Permeability of this Noden soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is very high.

Most areas of this unit are used as rangeland. A few areas are used for nonirrigated small grain. Areas of nonirrigated cropland are highly susceptible to water erosion and soil blowing and generally should be reseeded to grass.

The potential plant community on this unit is mainly big bluestem, little bluestem, and blue grama. Other grasses that characterize the unit are sideoats grama, needleandthread, and western wheatgrass. The average annual production of air-dry vegetation is about 1,300 pounds per acre. If the condition of the range deteriorates, blue grama, threeawn, sleepygrass, and hairy goldaster increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to windbreaks and environmental plantings. The risk of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are ponderosa pine and Rocky Mountain juniper. Among the shrubs are lilac and plum.

This unit is suited to homesite development. Excavation for roads and buildings increases the risk of erosion. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing.

Slope is a concern in installing septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability subclass VIe, nonirrigated. It is in Sandy Foothills range site.

54—Noden loam, 1 to 9 percent slopes. This deep, well drained soil is on uplands. It formed in mixed sediment. The native vegetation is mainly grass. Elevation is 6,200 to 7,500 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 100 to 125 days.

Typically, the surface layer is grayish brown loam about 7 inches thick. The subsoil is mainly clay loam about 25 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is neutral to a depth of 25 inches and mildly alkaline below that depth.

Included in this unit is about 10 percent Nunn loam on level flats and in drainageways. Also included are small areas of soils that are similar to this Noden soil but are moderately deep to bedrock. The soils in these areas are on low ridges and commonly have a cover of oak brush.

Permeability of this Noden soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is slight to very high, depending on slope.

Most areas of this unit are used as rangeland. A few areas are used for irrigated and nonirrigated crops. Hay and pasture are the main irrigated crops. Wheat is the main nonirrigated crop.

The potential plant community on this unit is mainly western wheatgrass, blue grama, and little bluestem. Other grasses that characterize the unit are Indian ricegrass, prairie junegrass, and sideoats grama. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, sleepygrass, threeawn, fringed sagebrush, and pricklypear increase. Range seeding is suitable if the range is in poor condtion.

This unit is well suited to irrigated pasture and hay. Hay commonly is drilled into oat stubble in spring or fall. The oat stubble is used as a ground cover.

Irrigation water can be applied by corrugations and by flooding from contour ditches. For the efficient application and removal of irrigation water, leveling is needed.

Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 3 tons of irrigated alfalfa hay per acre.

In areas of nonirrigated cropland, control of soil blowing and conservation of moisture are important concerns. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

Soil blowing can be reduced by planting crops in alternate strips at right angles to the prevailing wind. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. On long slopes, chiseling the stubble in fall slows runoff and reduces loss of moisture in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration.

With good management, this unit can produce 20 bushels per acre of wheat grown in a wheat-fallow cropping system.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be

needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and ponderosa pine. Among the shrubs are skunkbush sumac and lilac.

This unit is well suited to homesite development.

This map unit is in capability subclass IVe, irrigated and nonirrigated. It is in Loamy Foothills range site.

55—Noden-Bond sandy loams, 2 to 18 percent slopes. This map unit is on foot slopes and ridges (fig. 5). The native vegetation is mainly grass, but pinyon and juniper trees are on the ridges. Elevation is 6,200 to 7,300 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 100 to 125 days.

This unit consists of about 50 percent Noden sandy loam and about 30 percent Bond sandy loam. The Noden soil is on foot slopes and in the more nearly level areas of the unit, and the Bond soil is on ridges and in the steeper areas under pinyon and juniper. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Louviers very channery clay loam on long, narrow ridges. The Louviers soil is shallow over shale. Also included are small areas of Rock outcrop of sandstone on ridges.

Figure 5.—Area of Noden-Bond sandy loams, 2 to 18 percent slopes. Noden sandy loam in foreground, and Bond sandy loam in background adjacent to areas of Rock outcrop.

The Noden soil is deep and well drained. It formed in eolian and colluvial material derived dominantly from sandstone. Typically, the surface layer is dark grayish brown sandy loam about 10 inches thick. The subsoil is sandy clay loam about 20 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is neutral to a depth of 30 inches and mildly alkaline below that depth.

Permeability of the Noden soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is high.

The Bond soil is shallow and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is sandy clay loam about 13 inches thick. Sandstone is at a depth of 17 inches. The soil is neutral throughout.

Permeability of the Bond soil is moderate. Available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is medium, and the hazard of water erosion is very high.

This unit is used mainly as rangeland. It is also used as woodland.

The potential plant community on the Noden soil is mainly big bluestem, little bluestem, and blue grama. Other grasses that characterize this soil are sideoats grama, needleandthread, and western wheatgrass. The average annual production of air-dry vegetation is about 1,500 pounds per acre.

The potential plant community on the Bond soil is mainly pinyon and juniper and an understory of big bluestem, little bluestem, Scribner needlegrass, and sideoats grama. The potential production of the native understory vegetation in normal years is about 800 pounds of air-dry vegetation per acre.

Woodland products such as firewood, fenceposts, Christmas trees, and pinyon nuts generally are available in most areas of this unit. Mature stands of trees can produce 6 to 18 cords of firewood per acre if all trees are removed. Trees for transplanting can be obtained from this unit; however, the use of spades for removing the trees is severely limited on the Bond soil because of the shallow depth to sandstone.

Removing standing dead trees and opening the canopy generally enhance reporduction and promote the growth of grass and younger trees. Leaving high juniper stumps with several small live branches promotes the growth of a fencepost crop.

If this unit is used for homesite development, the main limitation is the areas of the Bond soil, which is shallow. These areas can be identified by the presence of Rock outcrop and the presence of pinyon and juniper trees. Slope is a concern on the steeper areas.

This map unit is in capability subclass VIe, nonirrigated. About 50 percent of the unit is in Sandy Foothills range site, and 50 percent is in Pinyon-Juniper woodland site.

56—Noden-Bond loams, 1 to 9 percent slopes. This map unit is on uplands, foot slopes, and ridges. The native vegetation is mainly grass. Elevation is 6,200 to 7,500 feet. The average annual precipitation is 15 to 18 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 100 to 125 days.

This unit is about 45 percent Noden loam and about 40 percent Bond loam. The Noden soil is in concave areas, and the Bond soil is on ridges and in the steeper areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent Louviers cobbly clay loam on ridges. The Louviers soil is shallow over shale. Also included are small areas of Nunn loam in playas and Rock outcrop of sandstone on ridges.

The Noden soil is deep and well drained. It formed in mixed sediment. Typically, the surface layer is grayish brown loam about 7 inches thick. The subsoil is mainly clay loam about 25 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is neutral to a depth of 25 inches and mildly alkaline below that depth.

Permeability of the Noden soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is slight to very high, depending on slope.

The Bond soil is shallow and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is brown loam about 3 inches thick. The subsoil is sandy clay loam about 13 inches thick. Sandstone is at a depth of 16 inches. The soil is neutral throughout.

Permeability of the Bond soil is moderately slow. Available water capacity is very low. Effective rooting depth is 12 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate to high.

This unit is used as rangeland.

The potential plant community on the Noden soil is mainly western wheatgrass, little bluestem, blue grama, and prairie junegrass. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, cheatgrass, fringed sagebrush, yucca, and cholla increase.

The potential plant community on the Bond soil is mainly big bluestem, sideoats grama, little bluestem, and needleandthread. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, pinyon, juniper, blue grama, and fringed sagebrush increase.

Range seeding generally is suitable if the range is in poor condition. The unit is limited for seeding in areas near Rock outcrop.

If this unit is used for homesite development, the main limitation is the areas of the Bond soil, which is shallow. These areas can be identified by the presence of Rock outcrop and the presence of pinyon and juniper trees.

This map unit is in capability subclass VIe, nonirrigated. About 50 percent of the unit is in Loamy Foothills range site, and 50 percent is in Shallow Foothills range site.

57—Nunn loam, 0 to 3 percent slopes. This deep, well drained soil is on terraces and fans. It formed in alluvium. The native vegetation is mainly grass. Elevation is 6,000 to 7,500 feet. The average annual precipitation is 15 to 16 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 125 days.

Typically, the surface layer is dark grayish brown loam about 4 inches thick. The upper 12 inches of the subsoil is mainly clay. The lower 23 inches is sandy clay loam. The substratum to a depth of 60 inches or more is fine sandy loam. The soil is neutral to a depth of 7 inches, mildly alkaline to a depth of 16 inches, and moderately alkaline below that depth.

Included in this unit is about 10 percent Noden loam in the steeper areas of the unit.

Permeability of this Nunn soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is slight.

Most areas of this unit are used as rangeland. A few areas are used for irrigated and nonirrigated crops. Hay and pasture are the main irrigated crops. Wheat is the main nonirrigated crop.

The potential plant community on this unit is mainly western wheatgrass, blue grama, and big bluestem. Other grasses that characterize the unit are prairie junegrass, needleandthread, and sideoats grama. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, threeawn, fringed sagebrush, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to irrigated hay and pasture. Irrigation water can be applied by corrugations and by flooding from contour ditches. Water needs to be applied at a slow rate over a long period to insure that the root zone is properly wetted. Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 4 tons of irrigated hay per acre.

In areas of nonirrigated cropland, the conservation of moisture is an important concern. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Soil blowing can be controlled by keeping the soil rough and cloddy when it is not protected by vegetation.

Excessive cultivation can result in the formation of a tillage pan. This pan can be broken by subsoiling when the soil is dry. On long slopes, chiseling the stubble in fall slows runoff and reduces loss of moisture in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration.

With good management, this unit can produce 18 bushels per acre of wheat grown in a wheat-fallow cropping system.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and ponderosa pine. Among the shrubs are lilac and American plum.

If this unit is used for homesite development, the main limitation is the shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

This map unit is in capability subclasses IIIc, irrigated, and IVc, nonirrigated. It is in Loamy Foothills range site.

58—Nunn stony loam, 2 to 5 percent slopes. This deep, well drained soil is on terraces and fans. It formed in alluvium. The native vegetation is mainly grass. Elevation is 6,000 to 7,200 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 49 to 52 degrees F, and the average frost-free period is 110 to 125 days.

Typically, 1 to 10 percent of the surface is covered with stones and cobbles, which occur as nests and stringers along drainageways. The surface layer is grayish brown stony loam about 8 inches thick. The subsoil is clay loam about 21 inches thick. The upper 13 inches of the substratum is clay loam, and the lower part to a depth of 60 inches or more is gravelly sandy loam. The soil is neutral to a depth of 21 inches and moderately alkaline below that depth.

Permeability of this Nunn soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight to moderate.

Most areas of this unit are used as rangeland. A few areas are used for irrigated and nonirrigated crops. Hay and pasture are the main irrigated crops. Wheat is the main nonirrigated crop.

The potential plant community on this unit is mainly western wheatgrass, blue grama, big bluestem, and little bluestem. Other grasses that characterize the unit are prairie junegrass, needleandthread, and sideoats grama. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, blue grama, rabbitbrush, pricklypear, and Gambel oak increase.

Range seeding is suitable if the range is in poor condition. Mechanical seeding is feasible in the areas between the nests and stringers of stones and cobbles.

If this unit is used for irrigated hay and pasture, the main limitation is the stones and cobbles on the surface.

Irrigation water can be applied by corrugations and by flooding from contour ditches. Leveling helps to insure the uniform application of water.

Seedbed preparation should be on the contour or across the slope where practical. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 3.5 tons of irrigated alfalfa hay per acre.

In areas of nonirrigated cropland, stones and cobbles on the surface and conservation of moisture are important concerns. Areas with a large amount of stones and cobbles on the surface should be avoided. In other areas, spring-loaded plows can be used for tillage.

Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Subsoiling increases the effective rooting depth.

With good management, this unit can produce 17 bushels per acre of wheat grown in a wheat-fallow cropping system.

If this unit is used for windbreaks and environmental plantings, the main limitation is the stones and cobbles on the surface. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and ponderosa pine. Among the shrubs are lilac and American plum.

The main limitation for homesite development is the shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields of conventional size do not function adequately because of the slow permeability of the soil. Other kinds of sewage disposal systems may be needed.

This map unit is in capability subclass IVe, irrigated and nonirrigated. It is in Loamy Foothills range site.

59—Nunn clay loam, 3 to 9 percent slopes. This deep, well drained soil is on terraces and fans. It formed in alluvium. The native vegetation is mainly grass. Elevation is 6,000 to 7,500 feet. The average annual precipitation is 15 to 16 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 125 days.

Typically, the surface layer is grayish brown clay loam 5 inches thick. The upper 5 inches of the subsoil is clay loam, and the lower 23 inches is clay. The substratum to a depth of 60 inches or more is clay loam. The soil is neutral to a depth of 18 inches, moderately alkaline to a depth of 40 inches, and neutral below that depth.

Included in this unit is about 10 percent Noden loam in the steeper areas of the unit. Also included are occasional small nests of stones and cobbles on the surface.

Permeability of this Nunn soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is moderate to very high.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture.

The potential plant community on this unit is mainly western wheatgrass, blue grama, and big bluestem. Other grasses that characterize the unit are prairie junegrass, needleandthread, and sideoats grama. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, snakeweed, threeawn, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to irrigated hay and pasture. Irrigation water can be applied by corrugations and by flooding from contour ditches. For the efficient application and removal of irrigation water, leveling is needed. Water needs to be applied at a slow rate over a long period to insure that the root zone is properly wetted.

Seedbed preparation should be on the contour or across the slope where practical. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 3.5 tons of irrigated alfalfa hay per acre.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and ponderosa pine. Among the shrubs are lilac and American plum.

If this unit is used for homesite development, the main limitation is the shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields of conventional size do not function adequately because of the slow permeability of the soil. Other kinds of sewage disposal systems may be needed.

This map unit is in capability subclass IVe, irrigated and nonirrigated. It is in Loamy Foothills range site.

60—Olney sandy loam, 3 to 12 percent slopes. This deep, well drained soil is on uplands. It formed in calcareous eolian material. The native vegetation is mainly grass. Elevation is 5,500 to 6,900 feet. The average annual precipitation is 13 to 15 inches, the average annual air temperature is 49 to 54 degrees F, and the average frost-free period is 125 to 160 days.

Typically, the surface layer is brown sandy loam about 3 inches thick. The upper 10 inches of the subsoil is mainly sandy clay loam, and the lower part is sandy clay loam about 5 inches thick. The substratum to a depth of 60 inches or more is fine sandy loam. The soil is neutral to a depth of 13 inches and moderately alkaline below that depth.

Included in this unit is about 10 percent Fort Collins loam in swales. Also included are small areas of Otero sandy loam on low ridges.

Permeability of this Olney soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is high to very high. The hazard of soil blowing is high.

Most areas of this unit are used as rangeland. A few areas are used for nonirrigated and irrigated crops. Hay and pasture are the main irrigated crops. Wheat is the main nonirrigated crop. Areas of nonirrigated cropland are highly susceptible to water erosion and soil blowing and generally should be reseeded to grass.

The potential plant community on this unit is mainly blue grama, sideoats grama, and western wheatgrass. Other grasses that characterize the unit are Indian ricegrass and sand dropseed. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, pricklypear, threeawn, sand dropseed, and yucca increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for irrigated hay and pasture, the main limitations are the hazard of erosion and the steepness of slope. Irrigation water can be applied by corrugations, flooding from contour ditches, and sprinklers. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion.

Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 4 tons of irrigated alfalfa hay per acre.

This unit is well suited to windbreaks and environmental plantings. The risk of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and ponderosa pine. Among the shrubs are caragana and lilac.

This unit is well suited to homesite development.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated. It is in Loamy Plains range site.

61—Olney-Progresso sandy loams, 3 to 15 percent slopes. This map unit is on uplands. The native vegetation is mainly grass, pinyon, and juniper. Elevation is 6,200 to 7,000 feet. The average annual precipitation is 14 to 17 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 130 days.

This unit is about 45 percent Olney sandy loam and about 35 percent Progresso sandy loam. The Olney soil is in the gently sloping areas of the unit, and the Progresso soil is on the steeper ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Louviers very channery clay loam and Travessilla channery sandy loam on ridges. These soils are shallow over shale and sandstone, respectively. Also included are small areas of Rock outcrop of sandstone on ridges.

The Olney soil is deep and well drained. It formed in calcareous eolian material. Typically, the surface layer is brown sandy loam about 4 inches thick. The subsoil is sandy clay loam about 22 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is neutral to a depth of 4 inches, mildly alkaline to a depth of 26 inches, and moderately alkaline below that depth.

Permeability of the Olney soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is high or very high.

The Progresso soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is brown sandy loam about 5 inches thick. The subsoil is sandy clay loam about 10 inches thick. The substratum is sandy loam about 9 inches thick. Sandstone bedrock is at a depth of 24 inches. The soil is mildly alkaline to a depth of 15 inches and moderately alkaline below that depth.

Permeability of the Progresso soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used as rangeland.

The potential plant community on the Olney soil is mainly western wheatgrass, blue grama, and sideoats grama. Other grasses that characterize the unit are Indian ricegrass and needleandthread. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, blue grama, snakeweed, pricklypear, and threeawn increase. Range seeding is suitable if the range is in poor condition.

The potential plant community on the Progresso soil is mainly pinyon and juniper and an understory of big bluestem, little bluestem, and sideoats grama. The potential production of the native understory vegetation in normal years is about 900 pounds of air-dry vegetation per acre. If the condition of the range deteriorates, blue grama, threeawn, and skunkbush sumac increase.

Woodland products such as firewood and pinyon nuts are available on this unit. The stands of pinyon and juniper, however, commonly are sparse.

If this unit is used for homesite development, the main limitations are moderate depth to bedrock in the Progresso soil and steepness of slope. Areas where there is a dense stand of pinyon and juniper trees are moderately deep to sandstone.

This map unit is in capability subclass VIe, nonirrigated. About 50 percent of the unit is in Loamy Foothills range site, and 50 percent is in Pinyon-Juniper woodland site.

62—Otero sandy loam, 1 to 9 percent slopes. This deep, somewhat excessively drained soil is on uplands with low dunelike relief. It formed in eolian sand. The native vegetation is mainly grass. Elevation is 5,500 to 6,300 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 135 to 165 days.

Typically, the surface layer is light brownish gray sandy loam about 7 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is mildly alkaline to a depth of 7 inches and moderately alkaline below that depth.

Included in this unit is about 20 percent Kim fine sandy loam in concave areas. Also included are small areas of Olney sandy loam in narrow drainageways.

Permeability of this Otero soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is slight to very high. The hazard of soil blowing is high.

This unit is used as rangeland.

The potential plant community on this unit is mainly sideoats grama, needleandthread, and little bluestem. Other grasses that characterize the unit are Indian ricegrass, blue grama, and thickspike wheatgrass. The average annual production of air-dry vegetation is about 1,400 pounds per acre. If the condition of the range deteriorates, threeawn, snakeweed, sand dropseed, yucca, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for windbreaks and environmental plantings, the main limitations are the droughtiness of the soil and the hazard of soil blowing in disturbed areas.

This unit is well suited to homesite development. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing.

This map unit is in capability subclass VIe, nonirrigated. It is in Sandy Plains range site.

63—Otero fine sandy loam, 1 to 9 percent slopes. This deep, somewhat excessively drained soil is on foot slopes and uplands. It formed in alluvium and eolian sand. The native vegetation is mainly grass. Elevation is 6,300 to 7,500 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 130 days.

Typically, the surface layer is light brownish gray sandy loam about 6 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is mildly alkaline to a depth of 6 inches and moderately alkaline below that depth.

Included in this unit is about 20 percent Kim fine sandy loam in areas between low, dunelike ridges. Also included are small areas of Olney sandy loam in drainageways.

Permeability of this Otero soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is slight to very high. The hazard of soil blowing is high.

This unit is used as rangeland.

The potential plant community on this unit is mainly big bluestem, little bluestem, and sand reedgrass. Other grasses that characterize the unit are blue grama, sideoats grama, needleandthread, and western wheatgrass. The average annual production of air-dry vegetation is about 1,100 pounds per acre. If the condition of the range deteriorates, blue grama, threeawn, snakeweed, yucca, and rabbitbrush increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for windbreaks and environmental plantings, the main limitations are the droughtiness of the soil and the hazard of soil blowing in disturbed areas.

This unit is well suited to homesite development. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing.

This map unit is in capability subclass VIe, nonirrigated. It is in Sandy Foothills range site.

64—Patent loam, 2 to 8 percent slopes. This deep, well drained soil is on fans and foot slopes and in swales. It formed in alluvium derived dominantly from sandstone, siltstone, and shale. The native vegetation is mainly grass. Elevation is 7,700 to 8,200 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 80 to 110 days.

Typically, the surface layer is brown loam about 2 inches thick. Below this to a depth of 60 inches or more is loam. The soil is moderately alkaline throughout.

Included in this unit is about 5 percent Brownsto very gravelly loam, commonly under scattered pinyon and juniper trees.

Permeability of this Patent soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate to very high.

This unit is used as rangeland and irrigated cropland. Hay and pasture are the main irrigated crops. Irrigated oats is also grown in a few areas. In years when

insufficient irrigation water is available, areas developed for irrigation are used for nonirrigated pasture.

The potential plant community on this unit is mainly western wheatgrass and blue grama. Other grasses that characterize the unit are Indian ricegrass and needleandthread. The average annual production of air-dry vegetation is about 1,000 pounds per acre. If the condition of the range deteriorates, blue grama, threeawn, rabbitbrush, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for irrigated hay and pasture, the main limitations are a short growing season and an unreliable supply of irrigation water. Irrigation water can be applied by corrugations and by flooding from contour ditches. Leveling helps to insure the uniform application of water.

Hay commonly is drilled into oat stubble in spring or fall. The oat stubble is used as a ground cover. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 3 tons of irrigated grass hay per acre.

This unit is well suited to homesite development. Permeability is somewhat restrictive for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated. It is in Loamy Foothills range site.

65—Penrose-Minnequa complex, 2 to 15 percent slopes. This map unit is on uplands. The native vegetation is mainly grass, pinyon, and juniper. Elevation is 5,500 to 6,200 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 135 to 165 days.

This unit is about 50 percent Penrose channery loam and about 35 percent Minnequa loam. The Penrose soil is in areas near Rock outcrop, and the Minnequa soil is on longer slopes further from Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Rock outcrop of limestone and shale along sharp slope breaks. Also included are small areas of Manvel loam in drainageways and depressional areas.

The Penrose soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from limestone. Typically, the surface layer is pale brown channery loam about 7 inches thick. Below this is channery loam about 7 inches thick. Fractured limestone is at a depth of 14 inches. The soil is moderately alkaline throughout.

Permeability of the Penrose soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium to rapid, and the hazard of water erosion is slight to very high.

The Minnequa soil is moderately deep and well drained. It formed in residuum and locally transported sediment derived dominantly from interbedded limestone and shale. Typically, the surface layer is light brownish gray loam about 6 inches thick. Below this is silt loam about 27 inches thick. Fractured limestone is at a depth of 33 inches. The soil is moderately alkaline throughout.

Permeability of the Minnequa soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to high.

This unit is used as rangeland.

The potential plant community on the Penrose soil is mainly pinyon and juniper and an understory of sideoats grama, blue grama, and New Mexico needlegrass. Other grasses that characterize the unit are little bluestem, frankenia, and Bigelow sagebrush. The potential production of the native understory vegetation in normal years is about 600 pounds of air-dry vegetation per acre. If the condition of the range deteriorates, cushion plants, threeawn, pinyon, and juniper increase.

The stands of pinyon and juniper are quite sparse, but they are adequate as a source of wood products such as firewood, fenceposts, and pinyon nuts.

The potential plant community on the Minnequa soil is mainly blue grama. Other grasses that characterize the unit are sideoats grama and western wheatgrass. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, threeawn, pricklypear, sand dropseed, and snakeweed increase. The main limitations for seeding are the areas of the shallow Penrose soil.

If this unit is used for homesite development, the main limitation is shallow depth to bedrock over much of the area. Areas some distance from Rock outcrop that do not support pinyon and juniper are moderately deep over limestone. In many areas the upper 3 or 4 feet of bedrock can be ripped with a light backhoe.

This map unit is in capability subclass VIe, nonirrigated. About 60 percent of the unit is in Limestone Breaks range site, and 40 percent is in Loamy Plains range site.

66—Penrose-Rock outcrop complex, 4 to 25 percent slopes. This map unit is on uplands and ridges. The native vegetation is mainly pinyon, juniper, and grass. Elevation is 5,500 to 6,200 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 135 to 165 days.

This unit is about 50 percent Penrose channery loam and about 30 percent Rock outcrop. The Penrose soil is in all mapped areas except those on foot slopes. The Rock outcrop is in the steeper areas of the unit. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent moderately deep Minnequa loam, which is intermingled with areas of

the Penrose soil. Also included are small areas of deep Manvel loam on foot slopes and moderately deep Razor clay loam near shale outcroppings.

The Penrose soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from limestone. Typically, the surface layer is pale brown channery loam about 2 inches thick. Below this is channery loam about 13 inches thick. Fractured limestone is at a depth of 15 inches. The soil is moderately alkaline throughout.

Permeability of the Penrose soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to very high.

Rock outcrop consists of nearly barren ledges of limestone interbedded with shale.

This unit is used as rangeland.

The potential plant community on the Penrose soil is mainly pinyon and juniper and an understory of sideoats grama, blue grama, New Mexico needlegrass, and little bluestem. Other grasses that characterize the unit are frankenia and Bigelow sagebrush. The potential production of the native understory vegetation in normal years is about 500 pounds of air-dry vegetation per acre. If the condition of the range deteriorates, galleta, threeawn, cushion plants, pinyon, and juniper increase. Livestock grazing should be managed to protect the soil from excessive erosion.

Woodland products such as firewood, fenceposts, and pinyon nuts are available on the Penrose soil in this unit. Removing standing dead trees and opening the canopy generally enhance reproduction and promote the growth of grass and younger trees. Leaving high juniper stumps with several small live branches promotes the growth of a fencepost crop.

This unit is poorly suited to homesite development. The main limitations are shallow depth to bedrock in the Penrose soil, areas of Rock outcrop, and steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. It is in Limestone Breaks range site.

67—Potts sandy loam, 1 to 8 percent slopes. This deep, well drained soil is on uplands. It formed in eolian material and alluvium derived dominantly from sandstone. The native vegetation is mainly grass. Elevation is 6,900 to 7,500 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 125 days.

Typically, the surface layer is pinkish gray sandy loam about 5 inches thick. The subsoil is mainly clay loam about 22 inches thick. The upper 8 inches of the substratum is loam. The lower part to a depth of 60 inches or more is sandy loam. The soil is mildly alkaline to a depth of 14 inches, moderately alkaline to a depth of 35 inches, and strongly alkaline below that depth.

Included in this unit is about 15 percent Neville fine sandy loam in steeper areas of the unit.

Permeability of this Potts soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight to high.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture.

The potential plant community on this unit is mainly western wheatgrass, blue grama, and sideoats grama. Other grasses that characterize the unit are needleanthread and prairie junegrass. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, sleepygrass, threeawn, snakeweed, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

If adequate irrigation water is available, this unit is suited to irrigated hay and pasture. Irrigation water can be applied by corrugations and by flooding from contour ditches. For the efficient application and removal of irrigation water, leveling is needed in sloping areas.

Seedbed preparation should be on the contour or across the slope where practical. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. If properly managed, this unit can produce 3 tons of irrigated alfalfa hay per acre.

This unit is well suited to windbreaks and environmental plantings. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are ponderosa pine and Rocky Mountain juniper. Among the shrubs are caragana and lilac.

This unit is well suited to homesite development.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated. It is in Loamy Foothills range site.

68—Razor clay loam, 1 to 12 percent slopes. This moderately deep, well drained soil is on hills and uplands. It formed in residuum and colluvium derived dominantly from shale. The native vegetation is mainly grass. Elevation is 5,500 to 6,600 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 49 to 54 degrees F, and the average frost-free period is 125 to 160 days.

Typically, the surface layer is yellowish brown clay loam about 3 inches thick. The subsoil is mainly clay about 20 inches thick. The substratum is silty clay loam 9 inches thick. Soft shale is at a depth of 32 inches. The soil is moderately alkaline throughout.

Included in this unit is about 20 percent deep Manzanola clay loam in drainageways and on foot slopes. Also included are small areas of shallow Midway clay on ridges.

Permeability of this Razor soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium to rapid, and the hazard of water erosion is moderate to very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly blue grama and western wheatgrass. Other grasses that characterize the unit are sideoats grama, winterfat, and needleandthread. The average annual production of air-dry vegetation is about 1,000 pounds per acre. If the condition of the range deteriorates, snakeweed, threeawn, galleta, and pricklypear increase. Livestock grazing should be managed to protect the soil in this unit from excessive erosion. Range seeding may not be successful, because the soil usually is dry below the thin surface layer.

This unit is poorly suited to windbreaks and environmental plantings. The main limitations are the limited rooting depth and the droughtiness of the soil.

If this unit is used for homesite development, the main limitation is the shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. Backfilling with material that has low shrink-swell potential can also reduce the effects of shrinking and swelling.

Septic tank absorption fields will not function adequately because of the slow permeability of the soil. In addition, the effluent may run downslope along the top of the shale and surface in lower lying areas.

This map unit is in capability subclass VIe, nonirrigated. It is in Loamy Plains range site.

69—Razor silty clay, 2 to 20 percent slopes. This moderately deep, well drained soil is on uplands. It formed in residuum and colluvium derived dominantly from shale. The native vegetation is mainly grass. Elevation is 5,500 to 6,300 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 49 to 54 degrees F, and the average frost-free period is 125 to 160 days.

Typically, the surface layer is light brownish gray silty clay about 7 inches thick. The subsoil is silty clay about 13 inches thick. The substratum is silty clay about 15 inches thick. Soft shale is at a depth of about 35 inches. The soil is moderately alkaline throughout.

Included in this unit is about 20 percent nearly level Limon silty clay loam that is deep over shale. Also included are small areas of shallow Midway clay on steep slopes and along the crest of long slopes and soils that are subject to severe gullying.

Permeability of this Razor soil is slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid to very rapid, and the hazard of water erosion is high to very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly alkali sacaton, western wheatgrass, blue grama, and sideoats grama. Other grasses that characterize the unit are winterfat, fourwing saltbush, and little bluestem. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, galleta, threeawn, snakeweed, and pricklypear increase. Livestock grazing should be managed to protect the soil from excessive erosion. Range seeding may not be successful, because the soil usually is dry.

This unit is poorly suited to windbreaks and environmental plantings. The main limitations are the limited rooting depth, the droughtiness of the soil, and the presence of deep gullies in some areas.

This unit is poorly suited to homesite development. It is limited mainly by shrink-swell potential. Slow permeability, slope, and the hazard of erosion are also limitations.

This map unit is in capability subclass VIe, nonirrigated. It is in Shaly Plains range site.

70—Ring cobbly sandy loam, 2 to 6 percent slopes. This deep, well drained soil is on terraces. It formed in alluvium. The native vegetation is mainly ponderosa pine and Gambel oak. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 18 to 22 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is 70 to 100 days.

Typically, the surface is covered with a mat of pine litter about 1 inch thick. The surface layer is brown cobbly sandy loam about 5 inches thick. The subsurface layer is brown cobbly sandy loam about 5 inches thick. The upper 9 inches of the subsoil is cobbly clay loam, and the lower 18 inches is mainly very cobbly sandy clay. The substratum to a depth of 60 inches or more is very cobbly sandy clay loam. The soil is slightly acid to a depth of 19 inches and neutral below that depth.

Included in this unit is about 10 percent Morop loam in small parks. Also included are nests of cobbles on the surface.

Permeability of this Ring soil is moderately slow. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is slight to moderate.

This unit is used for livestock grazing, woodland, wildlife habitat, and recreation.

The potential plant community is mainly ponderosa pine and an understory of Arizona fescue, mountain muhly, Gambel oak, and mountainmahogany. At lower elevations, Gambel oak commonly dominates the site. The potential production of the native understory vegetation in normal years is about 1,000 pounds of air-dry vegetation per acre.

This unit is suited to the limited production of ponderosa pine. The site index for this unit is about 54. The unit can produce about 3,000 cubic feet or 11,900 board feet (International rule) of merchantable timber per acre from a fully stocked stand of even-aged trees 100 years old. This unit is suited to the limited production of Christmas trees. This high value crop may be a viable economic alternative to the production of sawtimber. The use of spades for removing trees for transplanting is severely limited by the high content of cobbles in the soil.

Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills. Seeding in some areas is limited to the broadcast method because of the large amount of cobbles in the soil. Seeding late in fall helps to insure that the soil moisture content will be adequate for the establishment of seedlings next spring. Suitable seeding mixtures can include Manchar smooth brome, orchardgrass, intermediate wheatgrass or pubescent wheatgrass, and some alfalfa.

If this unit is used for homesite development, the main limitations are large stones and the shrink-swell potential. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation. The large amount of rock fragments in the soil makes excavation difficult.

This map unit is in capability subclass VIIs, nonirrigated. It is in the Ponderosa Pine woodland site.

71—Ring cobbly loam, 20 to 45 percent slopes. This deep, well drained soil is on terrace side slopes. It formed in alluvium. The native vegetation is mainly ponderosa pine and Gambel oak. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 18 to 22 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is 70 to 100 days.

Typically, the surface is covered with a mat of pine and oak litter about 1 inch thick. The surface layer is dark brown cobbly loam about 5 inches thick. The subsurface layer is brown cobbly clay loam about 2 inches thick. The upper 8 inches of the subsoil is cobbly sandy clay, and the lower 25 inches is very cobbly sandy clay. The substratum to a depth of 60 inches or more is very cobbly sandy clay loam. The soil is slightly acid to a depth of 15 inches and neutral below that depth.

Included in this unit is about 10 percent Wahatoya sandy loam on the crest of terrace edges. The Wahatoya soil is moderately deep over sandstone. Also included are small areas of Maitland fine sandy loam on foot slopes.

Permeability of this Ring soil is moderately slow. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid to very rapid, and the hazard of water erosion is very high.

This unit is used as woodland and for livestock grazing and wildlife habitat. Livestock grazing should be managed to protect the soil from erosion.

The potential plant community is mainly ponderosa pine and an understory of Arizona fescue, mountain muhly, Gambel oak, and mountainmahogany. At lower elevations, Gambel oak commonly dominates the site. The potential production of the native understory vegetation in normal years is about 1,000 pounds of air-dry vegetation per acre.

This unit is poorly suited to the production of ponderosa pine. Where the pine has been logged or burned, an understory of Gambel oak increases and generally excludes the pine. Harvesting of timber is not feasible because of the very low average site index, the steepness of slope, and the cobbles and stones on the surface.

This unit is poorly suited to homesite development. It is limited mainly by steepness of slope.

This map unit is in capability subclass VIIs, nonirrigated. It is in the Ponderosa Pine woodland site.

72—Riverwash-Las Animas complex. This map unit is on low stream terraces along major stream channels. Slope is 0 to 2 percent. The native vegetation is mainly cottonwood, willow, and some areas of grass. Elevation is 5,800 to 7,300 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 100 to 150 days.

This unit is about 65 percent Riverwash and about 30 percent Las Animas sandy loam. Riverwash consists of nearly barren areas of sand and gravel. The Las Animas soil is on well vegetated stream terraces. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent Glenberg sandy loam in the higher lying areas.

Riverwash is stratified sand and gravel. The water table is near the surface in most areas.

The Las Animas soil is deep and poorly drained. It formed in sandy alluvium. Typically, the surface layer is brown sandy loam about 6 inches thick. The next layer is sandy loam about 17 inches thick. The upper part of the substratum is loamy sand about 10 inches thick, and the lower part to a depth of 60 inches or more is sandy loam. The soil is moderately alkaline and slightly saline throughout.

Permeability of the Las Animas soil is moderately rapid. Available water capacity is low. Effective rooting depth is limited by the seasonal high water table that is at a depth of 0 to 18 inches from May to July. The soil is subject to brief periods of flooding in spring and summer. Runoff is slow, and the hazard of water erosion is slight.

This unit is used for wildlife habitat and some livestock grazing.

The potential plant community on this unit is mainly cottonwood, willow, sedge, alkali sacaton, and inland saltgrass. The average annual production of air-dry vegetation is highly variable. Salinity, sedimentation, and flooding significantly affect production. If the condition of the vegetation deteriorates, inland saltgrass, willow, and tamarack increase.

This unit is poorly suited to homesite development. The main limitations are the hazard of flooding and the seasonal high water table.

This map unit is in capability subclass VIIw, nonirrigated. It is in Riverbottom range site.

73—Rock outcrop. This map unit consists of steep, barren areas where sandstone or granite is exposed.

Slope is 50 percent to vertical. Elevation is 6,800 to 8,400 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 40 to 50 degrees F, and the average frost-free period is 80 to 110 days.

Rock outcrop commonly occurs as nearly vertical ledges and cliffs. The unit is about 90 percent or more exposed bedrock. Some soil material is in crevices in the rock and at the base of slopes. Accumulations of boulders are common at the base of slopes.

Use of this unit is limited. Some forms of wildlife use the unit to some extent for cover.

This map unit is in capability class VIII.

74—Rogert-Woodhall complex, 25 to 65 percent slopes. This map unit is on mountainsides and ridges. The native vegetation is mainly grass. Elevation is 8,500 to 10,000 feet. The average annual precipitation is 18 to 23 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 50 to 70 days.

This unit is about 50 percent Rogert very cobbly loam and about 40 percent Woodhall gravelly loam. The Rogert soil is on ridges and upper side slopes, and the Woodhall soil is on side slopes and foot slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent Coutis sandy loam at the base of slopes. Also included are small areas of Rock outcrop of granite on upper side slopes.

The Rogert soil is shallow and well drained. It formed in residuum derived dominantly from granite. Typically, the surface layer is dark grayish brown very cobbly loam about 6 inches thick. Below this is very gravelly sandy loam about 10 inches thick. Granite is at a depth of 16 inches. The soil is neutral throughout.

Permeability of the Rogert soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is very rapid, and the hazard of water erosion is high.

The Woodhall soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from igneous rock. Typically, the surface layer is dark brown gravelly loam about 10 inches thick. The subsoil is very stony clay loam about 24 inches thick. Granite is at a depth of 34 inches. The soil is neutral throughout.

Permeability of the Woodhall soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very high.

This unit is used as summer range.

The potential plant community on this unit is mainly Arizona fescue, mountain muhly, pine dropseed, and Parry oatgrass. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, Woods rose, slimstem muhly, and rabbitbrush increase. Slope limits access by livestock and results in overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock to graze in areas where access is limited. Range seeding is not practical because of the steepness of slope and the cobbles and stones on the surface.

This unit is poorly suited to homesite development. The main limitations are the steepness of slope and the shallow depth to bedrock on ridges and upper side slopes.

This map unit is in capability subclass VIIe, nonirrigated. It is in Shallow Loam range site.

75—Rubble Land-Rock outcrop complex. This map unit is on high mountainsides and peaks. It is almost entirely rock debris and Rock outcrop. The largest areas include the peaks and higher side slopes of Mount Mestas and the Sheep Mountains, which consist of igneous rock. Slope is 50 percent to vertical. Elevation is 9,000 to 12,000 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 36 to 42 degrees F, and the average frost-free period is 30 to 60 days.

This unit is about 50 percent Rubble Land and about 50 percent Rock outcrop. Small pockets of soil are in crevices in the rock. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Use of this unit is severely limited. Wildlife such as pikas, ptarmigan, and mountain sheep inhabit areas of the unit.

This map unit is in capability class VIII.

76—Schamber gravelly sandy loam, 3 to 15 percent slopes. This deep, excessively drained soil is on hills and terrace edges. It formed in gravelly alluvium. The native vegetation is mainly pinyon and juniper. Elevation is 6,600 to 7,500 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 100 to 125 days.

Typically, the surface layer is brown gravelly sandy loam about 4 inches thick. Below this to a depth of 60 inches or more is mainly very gravelly loamy sand. The soil is mildly alkaline to a depth of 4 inches and moderately alkaline below that depth.

Included in this unit is about 10 percent Kim fine sandy loam in depressional areas. The Kim soil has less gravel throughout the profile than this Schamber soil.

Permeability of this Schamber soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is medium to rapid, and the hazard of water erosion is moderate to very high.

This unit is used mainly as woodland and for livestock grazing. Many areas of the unit are a good source of roadfill.

The potential plant community is mainly pinyon and juniper and an understory of Indian ricegrass, mountainmahogany, blue grama, and muttongrass. Other grasses that characterize the unit are Scribner needlegrass, skunkbush, and sideoats grama. The potential production of the native understory vegetation in normal years is about 200 pounds of air-dry vegetation per acre.

Chaining the pinyon and juniper can increase the production of understory forage plants. Following chaining, proper grazing management is needed to reduce erosion and to lengthen the lifespan of the clearings. Range seeding is most successful if done in conjunction with chaining. Suitable seeding mixtures can include crested, pubescent, and intermediate wheatgrasses and blue grama.

Woodland products such as firewood, high-quality fenceposts, pinyon nuts, and Christmas trees are available on this unit. Mature stands of trees can produce 8 to 12 cords of firewood per acre if all trees are removed. Removing standing dead trees and opening the canopy generally enhance reproduction and promote the growth of grass and younger trees. The use of tree spades for transplant removal is severely limited by the cobbles and stones in the soil.

This unit is well suited to homesite development. If the density of housing is moderate to high, community sewage systems are needed to prevent contamination of water supplies as a result of seepage from onsite sewage disposal systems. If the soil in this unit is excavated, cutbanks may cave in.

This map unit is in capability subclass VIIs, nonirrigated. It is in Pinyon-Juniper woodland site.

77—Schamber-Midway complex, 3 to 25 percent slopes. This map unit is on hills, terrace edges, and side slopes. The native vegetation is mainly grass. Elevation is 5,500 to 6,600 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 49 to 54 degrees F, and the average frost-free period is 125 to 155 days.

This unit is about 65 percent Schamber sandy loam and about 20 percent Midway clay. The Schamber soil is in the gently sloping areas and on hilltops, and the Midway soil is on the steeper side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 15 percent Kim fine sandy loam on foot slopes and in drainageways.

The Schamber soil is deep and excessively drained. It formed in alluvium. Typically, the surface layer is brown gravelly sandy loam about 5 inches thick. The next 25 inches is mainly very gravelly loamy sand. Below this to a depth of 60 inches or more is very gravelly sand. The soil is moderately alkaline throughout.

Permeability of the Schamber soil is very rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate to very high.

The Midway soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from shale. Typically, the surface layer is grayish brown clay about 3 inches thick. The next 3 inches is clay. Below this is clay about 12 inches thick. Platy shale is at a depth of 15 inches. The soil is moderately alkaline and slightly saline throughout.

Permeability of the Midway soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid to very rapid, and the hazard of water erosion is very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly sideoats grama, blue grama, and Indian ricegrass. Other grasses that characterize the unit are needleandthread and sand dropseed. The average annual production of air-dry vegetation is about 700 pounds per acre. If the condition of the range deteriorates, rabbitbrush, threeawn, yucca, and cactus increase. Livestock grazing should be managed to protect the unit from excessive erosion. The main limitations for seeding are droughtiness and very gravelly material near the surface of the soils.

This unit is poorly suited to windbreaks and environmental plantings. The main limitations are the salinity, limited rooting depth, and slope of the Midway soil and the droughtiness of both of the soils in the unit.

If this unit is used for homesite development, the main limitations are slope in the steeper shaly areas and shrink-swell potential. The gently sloping areas of the Schamber soil are well suited to homesite development.

Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health.

This map unit is in capability subclass VIIs, nonirrigated. About 75 percent of the unit is in Gravel Breaks range site, and 25 percent is in Shaly Plains range site.

78—Tisworth sandy loam, 2 to 8 percent slopes. This deep, well drained soil is on alluvial fans. It formed in alluvium. The native vegetation is mainly grass. Elevation is 7,000 to 7,500 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 43 to 45 degrees F, and the average frost-free period is 100 to 120 days.

Typically, the surface layer is pinkish gray sandy loam about 3 inches thick. The upper part of the subsoil is clay loam about 12 inches thick, and the lower part is sandy loam about 9 inches thick. The upper 21 inches of the substratum is stratified sandy loam and loam, and the lower part to a depth of 60 inches or more is sandy loam. The soil is moderately alkaline to a depth of 3 inches and strongly alkaline below that depth. It is slightly alkali-affected to moderately alkali-affected.

Included in this unit is about 20 percent Neville fine sandy loam.

Permeability of this Tisworth soil is slow. The available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high to very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly alkali sacaton and blue grama. Other plants that characterize the unit are western wheatgrass and fourwing saltbush. The average annual production of air-dry vegetation is about 1,300 pounds per acre. If the condition of the range deteriorates, black greasewood, inland saltgrass, and rabbitbrush increase.

If this unit is used for homesite development, the main limitation is the alkali in the soil.

This map unit is in capability subclass VIIe, nonirrigated. It is in Salt Flat range site.

79—Tolman-Rock outcrop complex, 25 to 65 percent slopes. This map unit is on mountainsides. The native vegetation is mainly grass. Elevation is 7,000 to 8,800 feet. The average annual precipitation is 18 to 24 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 70 to 90 days.

This unit is about 60 percent Tolman stony sandy loam and about 20 percent Rock outcrop. The Tolman soil is on ridges and side slopes, and Rock outcrop occurs as long escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 20 percent deep Ring cobbly sandy loam at the base of slopes.

The Tolman soil is shallow and well drained. It formed in residuum and colluvium derived dominantly from sandstone. Typically, the surface layer is dark grayish brown stony sandy loam about 4 inches thick over reddish brown stony sandy loam about 4 inches thick. The subsoil is very stony sandy clay loam about 10 inches thick. Sandstone is at a depth of 18 inches. The soil is neutral throughout.

Permeability of the Tolman soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

Rock outcrop consists of nearly barren sandstone ledges and cliffs.

This unit is used as summer range.

The potential plant community on this unit is mainly Arizona fescue, mountain muhly, pine dropseed, and Parry oatgrass. The average annual production of air-dry vegetation is about 750 pounds per acre. If the condition of the range deteriorates, blue grama, Kentucky bluegrass, slimstem muhly, and Gambel oak increase. Slope limits access by livestock and results in overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited.

This unit is poorly suited to homesite development. The main limitations are steepness of slope and shallow depth to hard bedrock.

This map unit is in capability subclass VIIe, nonirrigated. It is Shallow Loam range site.

80—Trag loam, 3 to 12 percent slopes. This deep, well drained soil is on benches and foot slopes. It formed in medium textured alluvium and colluvium. The native vegetation is mainly grass. Elevation is 7,800 to 8,500 feet. The average annual precipitation is 18 to 23 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 70 to 90 days.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. The subsoil is sandy clay loam about 50 inches thick. The substratum to a depth of 60 inches or more is sandy clay loam. The soil is neutral throughout.

Included in this unit is about 5 percent Breece sandy loam in narrow drainageways.

Permeability of this Trag soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate to very high.

This unit is used as summer range.

The potential plant community on this unit is mainly Arizona fescue, mountain muhly, and Parry oatgrass. Other grasses that characterize the unit are mountain brome, prairie junegrass, and needlegrasses. The average annual production of air-dry vegetation is about 1,600 pounds per acre. If the condition of the range deteriorates, blue grama, slimstem muhly, and fringed sagebrush increase. Range seeding is suitable if the range is in poor condition.

This unit is well suited to homesite development. The risk of erosion is increased if the soil is left exposed during site development.

This map unit is in capability subclass IVe, nonirrigated. It is in Loamy Park range site.

81—Travessilla-Kim complex, 1 to 9 percent slopes. This map unit is on uplands. The native vegetation is mainly grass. Elevation is 5,500 to 6,200 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 135 to 165 days.

This unit is about 70 percent Travessilla channery sandy loam and about 20 percent Kim fine sandy loam. The Travessilla soil is on ridges and in the steeper areas, and the Kim soil is in the more nearly level areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Rock outcrop of sandstone on ridges.

The Travessilla soil is shallow and well drained. It formed in residuum derived dominantly from sandstone.

Typically, the surface layer is light brownish gray channery sandy loam about 6 inches thick. The substratum is channery sandy loam about 9 inches thick. Sandstone is at a depth of 15 inches. The soil is mildly alkaline to a depth of 6 inches and moderately alkaline below that depth.

Permeability of the Travessilla soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is medium, and the hazard of water erosion is high to very high.

The Kim soil is deep and well drained. It formed in alluvium and eolian fine sand and silt derived dominantly from sandstone. Typically, the surface layer is light brownish gray fine sandy loam about 8 inches thick. The substratum to a depth of 60 inches or more is loam. The soil is mildly alkaline to a depth of 8 inches and moderately alkaline below that depth.

Permeability of the Kim soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is slight to high. The hazard of soil blowing is high.

This unit is used as rangeland.

The potential plant community on the Travessilla soil is mainly sideoats grama, blue grama, little bluestem, western wheatgrass, and widely spaced pinyon and juniper. The average annual production of air-dry vegetation is about 700 pounds per acre. If the condition of the range deteriorates, blue grama, sand dropseed, pricklypear, snakeweed, and juniper increase. Range seeding generally is not advisable because of droughtiness and the areas of Rock outcrop.

The potential plant community on the Kim soil is mainly blue grama and sideoats grama. Other grasses that characterize the unit are Indian ricegrass and western wheatgrass. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, pricklypear, sand dropseed, threeawn, and snakeweed increase. Range seeding is suitable if the range is in poor condition.

This unit is poorly suited to homesite development, because most areas are shallow to hard bedrock.

This map unit is in capability subclass VIe, nonirrigated. About 80 percent of the unit is in Sandstone Breaks range site, and 20 percent is in Loamy Plains range site.

82—Travessilla-Rock outcrop complex, 15 to 45 percent slopes. This map unit is on ridges and canyonsides (fig. 6). The native vegetation is mainly grass. Elevation is 5,500 to 6,200 feet. The average annual precipitation is 11 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 135 to 165 days.

This unit is about 50 percent Travessilla channery sandy loam and about 30 percent Rock outcrop. The Travessilla soil is on ridgetops and steep canyonsides, and Rock outcrop is mainly on canyon rims. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent deep Kim fine sandy loam on toe slopes and about 5 percent deep sandy loam adjacent to streams in canyons. Also included are small areas of Rubble Land at the base of sandstone escarpments.

The Travessilla soil is shallow and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is light brownish gray channery sandy loam about 6 inches thick. The substratum is channery sandy loam about 9 inches thick. Sandstone is at a depth of 15 inches. The soil is mildly alkaline to a depth of 6 inches and moderately alkaline below that depth.

Permeability of the Travessilla soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 6 to 20 inches. Runoff is rapid, and the hazard of water erosion is very high.

Rock outcrop consists of barren sandstone escarpments and some vertical canyon walls.

This unit is used as rangeland.

The potential plant community on this unit is mainly sideoats grama, blue grama, little bluestem, western wheatgrass, and widely spaced juniper. The average annual production of air-dry vegetation is about 700 pounds per acre. If the condition of the range deteriorates, pricklypear, sand dropseed, snakeweed, and juniper increase. Range seeding generally is limited to toe slopes and flood plains in canyons. Slope limits access by livestock and results in overgrazing of the less sloping areas. Livestock grazing should be managed to protect the grazable areas from excessive erosion.

This unit is poorly suited to homesite development. The main limitations are shallow depth to bedrock, extensive areas of Rock outcrop, and steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. It is in Sandstone Breaks range site.

83—Uinta-Lakehelen fine sandy loams, 4 to 25 percent slopes. This map unit is on mountains and benches. The native vegetation is mainly conifer forest. Elevation is 8,000 to 9,600 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 40 to 70 days.

This unit is about 50 percent Uinta fine sandy loam and about 40 percent Lakehelen fine sandy loam. The Uinta soil is on side slopes, foot slopes, and benches, and the Lakehelen soil is on mountaintops and upper side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Leadville fine sandy loam adjacent to stream channels.

The Uinta soil is deep and well drained. It formed in

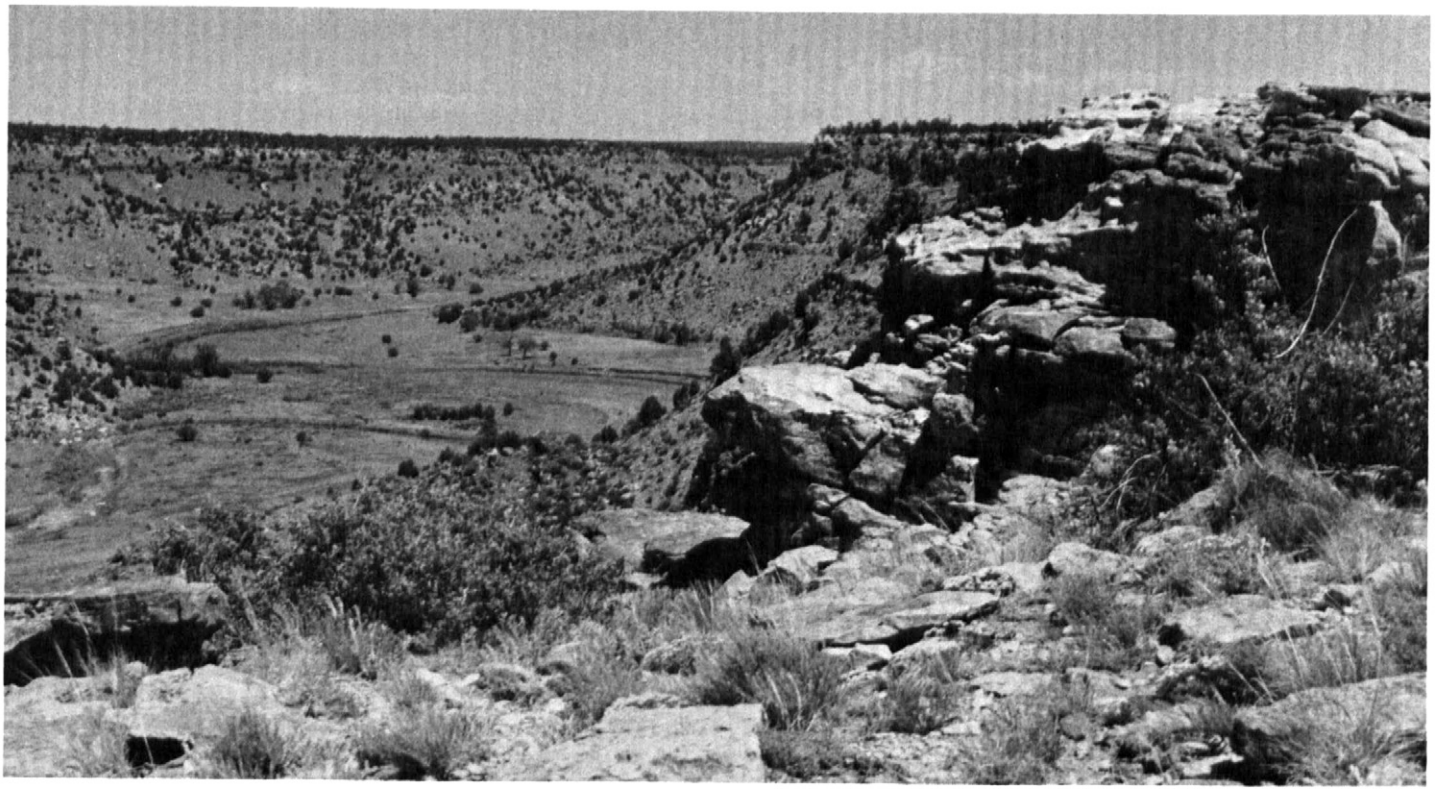


Figure 6.—Area of Travessilla-Rock outcrop complex, 15 to 45 percent slopes.

residuum and colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of forest litter about 1 inch thick. The surface layer is brown fine sandy loam about 3 inches thick. The subsurface layer is pinkish gray sandy loam about 12 inches thick. The subsoil is sandy clay loam about 37 inches thick. The substratum to a depth of 60 inches or more is sandy clay loam. The soil is neutral throughout.

Permeability of the Uinta soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high to very high.

The Lakehelen soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from sandstone. Typically, the surface is covered with a mat of partially decomposed needles and twigs about 1 inch thick. The surface layer is pinkish gray fine sandy loam about 4 inches thick over light reddish brown fine sandy loam about 8 inches thick. The subsoil is extremely cobbly sandy clay loam about 16 inches thick. Sandstone is at a depth of 28 inches. The soil is slightly acid to a depth of 4 inches, medium acid to a depth of 12 inches, and slightly acid below that depth.

Permeability of the Lakehelen soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high to very high.

This unit is used as woodland and for wildlife habitat and recreation.

The potential plant community on this unit is mainly lodgepole pine, Douglas-fir, and white fir and an understory of nodding brome, Oregon-grape, elk sedge, and common juniper. The potential production of the native understory vegetation in normal years is about 100 pounds of air-dry vegetation per acre. Livestock grazing is limited to occasional small parks.

This unit is suited to the limited production of lodgepole pine. The site index for this unit is about 40. The unit can produce about 2,400 cubic feet or 6,300 board feet (International rule) of merchantable timber per acre from a fully stocked stand of even-aged trees 120 years old. Woodland products such as corral poles, fenceposts, building poles, pulp, utility poles, and sawtimber are available on this unit. Conventional methods of harvesting timber can be used.

Minimizing the risk of erosion is essential in harvesting timber. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. Roads and landings can be protected from erosion by constructing water bars and by seeding

cuts and fills. Suitable seeding mixtures can include Arizona fescue, Manchar smooth brome, orchardgrass, and yellow sweetclover. Seeding late in fall helps to insure that the soil moisture content will be adequate for the establishment of seedlings next spring.

The gently sloping areas on the lower side slopes and benches are well suited to homesite development. The main limitations on the upper side slopes and mountaintops are steepness of slope, the hazard of erosion, and cobbles in the soil. The large amount of rock fragments in the soil makes excavation difficult. Erosion can be reduced by disturbing only the part of the site that is used for construction.

This map unit is in capability subclass VIe, nonirrigated. It is in the Lodgepole Pine woodland site.

84—Ustic Torriorthents-Rock outcrop complex, 5 to 40 percent slopes. This map unit is in extremely rough and eroded areas, mainly along the side slopes of deeply dissected terraces. The native vegetation is mainly pinyon and juniper. Elevation is 6,800 to 7,600 feet. The average annual precipitation is 11 to 14 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 100 to 125 days.

This unit is about 55 percent Ustic Torriorthents and about 15 percent Rock outcrop. Ustic Torriorthents are throughout the unit, and Rock outcrop is near the crest of slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 15 percent Neville fine sandy loam on foot slopes and about 10 percent Travessilla channery sandy loam near sandstone outcroppings. The Neville soil is deep, and the Travessilla soil is shallow to sandstone. Also included are small areas of Schamber gravelly sandy loam on ridgetops. It is deep and has a sandy substratum.

Ustic Torriorthents are shallow and moderately deep and are well drained. They formed in residuum and colluvium derived mainly from siltstone and shale. These soils are variable, but a profile commonly observed in the survey area has a surface layer of brown gravelly loam about 3 inches thick. The substratum is clay loam about 12 inches thick. Weathered siltstone is at a depth of 15 inches. These soils are moderately alkaline and are nonsaline to slightly saline throughout.

Permeability of the Ustic Torriorthents is moderate or moderately slow. Available water capacity is very low to low. Effective rooting depth is 10 to 40 inches. Runoff is rapid to very rapid, and the hazard of water erosion is very high.

Rock outcrop consists of barren sandstone escarpments.

This unit is used for livestock grazing and wildlife habitat.

The potential plant community is mainly pinyon and juniper and an understory of blue grama, Indian ricegrass, and western wheatgrass. The potential production of the native understory in normal years is about 100 pounds of air-dry vegetation per acre. Livestock grazing is limited by the low production of vegetation.

Many areas have only sparse stands of pinyon and juniper, and some areas are nearly barren. The pinyon and juniper have limited economic value. Woodland products such as firewood, fenceposts, Christmas trees, and pinyon nuts are available on this unit; however, in many areas steepness of slope limits access to remove wood products.

This unit generally is poorly suited to homesite development. The main limitations are steepness of slope and shallow depth to bedrock. Onsite investigations are needed to evaluate specific sites for homesite development.

This map unit is in capability subclass VIIe, nonirrigated. It is the Pinyon-Juniper woodland site.

85—Utica gravelly sandy loam, 2 to 10 percent slopes. This deep, excessively drained soil is on terraces and fans. It formed in alluvium. The native vegetation is mainly grass. Elevation is 7,600 to 8,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 80 to 110 days.

Typically, the surface layer is brown gravelly sandy loam about 7 inches thick. The next layer is gravelly sandy loam about 8 inches thick. The substratum to a depth of 60 inches or more is very gravelly loamy sand. The soil is mildly alkaline to a depth of 15 inches. Below that depth, it is moderately alkaline and has a high content of calcium carbonate.

Included in this unit is about 20 percent Patent loam in depressional areas. The Patent soil has fewer rock fragments than this Utica soil and is more clayey.

Permeability of this Utica soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is slight to very high.

The potential plant community on this unit is mainly western wheatgrass, little bluestem, blue grama, and sideoats grama. Other grasses that characterize the unit are prairie junegrass and needleandthread. The average annual production of air-dry vegetation is about 1,000 pounds per acre. If the condition of the range deteriorates, sleepygrass, threeawn, snakeweed, and pricklypear increase. Range seeding is suitable if the range is in poor condition.

This unit is suited to homesite development. Cobbles and stones make excavation difficult. Removal of cobbles and gravel in disturbed areas is required for best results when landscaping. The risk of erosion is increased if the soil is left exposed during site development.

This map unit is in capability subclass VIe, nonirrigated. It is in Sandy Foothills range site.

86—Vona fine sandy loam, 1 to 5 percent slopes. This deep, well drained soil is on undulating uplands. It formed in eolian sand. The native vegetation is mainly grass. Elevation is 5,500 to 6,200 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 130 to 160 days.

Typically, the surface layer is light brownish gray fine sandy loam about 6 inches thick. The subsoil is sandy loam about 26 inches thick. The substratum to a depth of 60 inches or more is sandy loam. The soil is neutral to a depth of 17 inches and moderately alkaline below that depth.

Included in this unit is about 10 percent Olney sandy loam in drainageways.

Permeability of this Vona soil is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow to medium, and the hazard of water erosion is slight to high. The hazard of soil blowing is very high, especially on ridges, because of the short, undulating slopes and droughtiness.

This unit is used as rangeland.

The potential plant community on this unit is mainly blue grama, needleandthread, Indian ricegrass, and sideoats grama. The average annual production of air-dry vegetation is about 1,000 pounds per acre. If the condition of the range deteriorates, sand dropseed, threeawn, and Russian-thistle increase. Livestock grazing should be managed to protect the soil in this unit from excessive erosion. Range seeding is suitable if the range is in poor condition.

If this unit is used for windbreaks and environmental plantings, the main limitations are the hazard of soil blowing and droughtiness. The risk of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Russian-olive and Rocky Mountain juniper. Among the shrubs are Siberian peashrub and plum.

This unit is well suited to homesite development. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing.

This map unit is in capability subclass VIe, nonirrigated. It is in Sandy Plains range site.

87—Wahatoya-Rock outcrop complex, 35 to 65 percent slopes. This map unit is on side slopes. The native vegetation is mainly Gambel oak and ponderosa pine. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 17 to 20 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 70 to 90 days.

This unit is about 65 percent Wahatoya gravelly sandy loam and about 15 percent Rock outcrop. The Wahatoya soil is in areas throughout the unit, and Rock outcrop commonly occurs as steep, vertical escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Ring cobbly sandy loam on foot slopes. The Ring soil is deep and is very cobbly below the surface layer. Also included are small areas of Maitland very fine sandy loam on foot slopes. The Maitland soil is deep and contains few rock fragments.

The Wahatoya soil is moderately deep and well drained. It formed in residuum derived dominantly from conglomeritic sandstone. Typically, the surface is covered with a mat of decomposed forest litter about 1 inch thick. The surface layer is dark brown gravelly sandy loam about 2 inches thick over pinkish gray gravelly sandy loam about 4 inches thick. The subsoil is very gravelly sandy clay loam about 16 inches thick. The substratum is very gravelly sandy loam about 4 inches thick. Sandstone is at a depth of 26 inches. The soil is neutral throughout.

Permeability of the Wahatoya soil is moderate. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is very high.

Rock outcrop consists of nearly barren areas of sandstone.

This unit is used for livestock grazing, woodland, recreation, and wildlife habitat.

The potential plant community is mainly ponderosa pine and an understory of Gambel oak, mountainmahogany, mountain muhly, and bluegrasses. The potential production of the native understory vegetation in normal years is about 1,000 pounds of air-dry vegetation per acre. Steepness of slope limits access by livestock. Trails or walkways can be constructed in places to encourage livestock grazing in areas where access is limited.

This unit is poorly suited to the production of ponderosa pine. Many areas support mainly Gambel oak and a few scattered pine. The steepness of slope limits the kinds of equipment that can be used in forest management.

This unit is poorly suited to homesite development. The main limitations are steepness of slope and the areas of Rock outcrop.

This map unit is in capability subclass VIIs, nonirrigated. It is in the Ponderosa Pine woodland site.

88—Welring very channery loam, 4 to 25 percent slopes. This shallow, well drained soil is on ridges. It formed in residuum and colluvium derived dominantly from limestone. The native vegetation is mainly pinyon and juniper. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 12 to 14 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 100 to 125 days.

Typically, the surface layer is light brownish gray very channery loam about 4 inches thick. Below this is very

channery loam about 14 inches thick. Limestone is at a depth of 18 inches. The soil is moderately alkaline throughout.

Included in this unit is about 15 percent moderately deep Minnequa loam intermingled with this Welring soil on midslopes and about 15 percent deep Manvel silty clay loam on foot slopes. Also included are small areas of Rock outcrop of limestone on the crest of steep slopes.

Permeability of this Welring soil is moderate. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid, and the hazard of water erosion is high to very high.

This unit is used for livestock grazing and as woodland.

The potential plant community is mainly pinyon and juniper and an understory of Indian ricegrass, muttongrass, needleandthread, and Scribner needlegrass. Other plants that characterize the unit are mountainmahogany and skunkbush. The potential production of the native understory vegetation in normal years is about 300 pounds of air-dry vegetation per acre.

Woodland products such as firewood, fenceposts, and pinyon nuts are available on this unit. Removing standing dead trees and opening the canopy generally enhance reproduction and promote the growth of grass and younger trees. Leaving high juniper stumps with several small live branches promotes the growth of a fencepost crop.

This unit is poorly suited to homesite development. The main limitations are shallow depth to bedrock and steepness of slope.

This map unit is in capability subclass VIIe, nonirrigated. It is in Pinyon-Juniper woodland site.

89—Wetmore-Mortenson Association, 20 to 50 percent slopes. This map unit is on mountainsides and ridges. The native vegetation is mainly ponderosa pine on the Wetmore soil and fir on the Mortenson soil. Elevation is 7,400 to 8,600 feet. The average annual precipitation is 23 to 25 inches, the average annual air temperature is 42 to 44 degrees F, and the average frost-free period is 75 to 90 days.

This unit is 50 percent Wetmore very gravelly coarse sandy loam and 40 percent Mortenson very stony loam. The Wetmore soil is on ridges and on south- and east-facing slopes, and the Mortenson soil is on north- and west-facing slopes.

Included in this unit is about 5 percent Ring cobbly loam and 5 percent Rock outcrop.

The Wetmore soil is shallow and well drained. It formed in residuum derived dominantly from granite. Typically, the surface is covered with a mat of partially decomposed pine needles, leaves, and twigs 2 inches thick. The surface layer is very gravelly coarse sandy loam 5 inches thick. The next layer is very gravelly coarse sandy loam 5 inches thick. The subsoil is extremely gravelly coarse sandy loam 4 inches thick. Granite is at a depth of 14 inches. The soil is neutral throughout.

Permeability of the Wetmore soil is rapid. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

The Mortenson soil is deep and well drained. It formed in colluvium and residuum derived dominantly from granite. Typically, the surface is covered with a mat of partially decomposed needles about 1 inch thick. The surface layer is pale brown very stony loam 6 inches thick. The subsurface layer is very stony sandy loam 16 inches thick. The next layer is very stony sandy clay loam 7 inches thick. The subsoil to a depth of 60 inches or more is very cobbly clay. The soil is neutral to a depth of 6 inches, slightly acid to a depth of 40 inches, and neutral below that depth.

Permeability of the Mortenson soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as woodland and for wildlife habitat and recreation.

The potential plant community on the Wetmore soil is mainly ponderosa pine and an understory of Gambel oak, snowberry, mountain muhly, and pine dropseed. The potential production of native understory on the Wetmore soil is about 225 pounds of air-dry vegetation per acre. The potential plant community on the Mortenson soil is mainly Douglas-fir and white fir and an understory of common juniper, kinnikinnick, snowberry, elk sedge, and Oregon-grape. Steep slopes and the dense forest cover on the Mortenson soil limit access by livestock. The forage production on the Mortenson soil is very low.

The Wetmore soil is very poorly suited to the production of wood crops. The site index for ponderosa pine is about 35. The Mortenson soil is suited to the limited production of Douglas-fir. On the basis of a site index of 65, the potential production per acre of merchantable timber is 4,000 cubic feet or 18,300 board feet (International rule, one-fourth inch kerf) from an even-aged, fully stocked stand of trees 100 years old.

This unit is suited to the limited production of Christmas trees. This high value crop may be a viable economic alternative to the production of sawtimber.

The main concerns in producing and harvesting timber are steepness of slope and stoniness. Conventional methods of harvesting timber are difficult to use because of slope. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

Spoil from excavations is subject to rill and gully erosion and to sloughing. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills. To provide an adequate seedbed, the

surface should be chiseled or otherwise disturbed. Seeding late in fall helps to insure that the soil moisture content will be adequate for the establishment of seedlings next spring. Suitable seeding mixtures can include Manchar smooth brome, orchardgrass, intermediate or pubescent wheatgrass, and some alfalfa.

This unit is poorly suited to homesite development. The main limitations of the Wetmore soil are steepness of slope and shallow depth to bedrock, and the main limitations of the Mortenson soil are steepness of slope and stoniness.

This map unit is in capability subclass VIIs, nonirrigated. About 60 percent of the unit is in Ponderosa Pine woodland site, and 40 percent is in Douglas-fir woodland site.

90—Wiley loam, 1 to 3 percent slopes. This deep, well drained soil is on uplands. It formed in loess. The native vegetation is mainly grass. Elevation is 5,500 to 6,200 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 135 to 165 days.

Typically, the surface layer is light brownish gray loam 4 inches thick. The upper 10 inches of the subsoil is silty clay loam, and the lower 9 inches is silt loam. The substratum to a depth of 60 inches or more is silt loam. The soil is mildly alkaline to a depth of 4 inches and moderately alkaline below that depth.

Included in this unit is about 10 percent Baca loam in depressional areas and drainageways. The Baca soil has a clayey subsoil.

Permeability of this Wiley soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate.

Most areas of this unit are used as rangeland. A few areas are used for nonirrigated and irrigated crops. Hay and pasture are the main irrigated crops. Wheat is the main nonirrigated crop.

The potential plant community on this unit is mainly blue grama. Other grasses that characterize the unit are western wheatgrass and sideoats grama. The average annual production of air-dry vegetation is about 900 pounds per acre. If the condition of the range deteriorates, blue grama, threeawn, and sand dropseed increase. Range seeding is suitable if the range is in poor condition.

In nonirrigated areas control of erosion and conservation of moisture are important concerns. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

Stripcropping and field windbreaks help to control soil blowing and to conserve moisture. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Soil blowing can also be controlled by keeping the soil rough and cloddy when it is not protected by vegetation.

With good management, this unit is capable of producing 12 bushels per acre of wheat grown in a wheat-fallow cropping system.

This unit is well suited to irrigated crops. Because the supply of irrigation water is limited, hay and pasture are the main irrigated crops. Water can be applied by corrugations and by flooding from contour ditches. Leveling helps to insure the uniform application of water. Nonleguminous crops respond to nitrogen and phosphorus, and leguminous crops respond to phosphorus. If properly managed, this unit can produce 4.5 tons of irrigated alfalfa hay per acre.

This unit is well suited to windbreaks and environmental plantings. The risk of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Rocky Mountain juniper and ponderosa pine. Among the shrubs are honeysuckle and plum.

This unit is suited to homesite development. The risk of erosion is increased if the soil is left exposed during site development. Shrink-swell potential can be overcome by placing footings of buildings below the subsoil layer. Permeability is somewhat restrictive for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field.

This map unit is in capability subclasses IIe, irrigated, and IVe, nonirrigated. It is in Loamy Plains range site.

91—Wiley-Kim loams, 2 to 9 percent slopes. This map unit is on uplands. The native vegetation is mainly grass. Elevation is 5,500 to 6,200 feet. The average annual precipitation is 12 to 15 inches, the average annual air temperature is 50 to 54 degrees F, and the average frost-free period is 135 to 165 days.

This unit is 55 percent Wiley loam and 40 percent Kim loam. The Wiley soil is on the gentler slopes and in concave areas, and the Kim soil is on the steeper slopes and ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent Schamber sandy loam on ridges. The Schamber soil is very gravelly or very cobbly below the surface layer. Also included are small areas of shallow Travessilla channery sandy loam near isolated areas of Rock outcrop.

The Wiley soil is deep and well drained. It formed in silt and fine sand derived dominantly from loess. Typically, the surface layer is light brownish gray loam 4 inches thick. The upper 10 inches of the subsoil is silty clay loam, and the lower 9 inches is silt loam. The substratum to a depth of 60 inches or more is silt loam. The soil is mildly alkaline to a depth of 4 inches and moderately alkaline below that depth.

Permeability of the Wiley soil is moderate. Available water capacity is high. Effective rooting depth is 60

inches or more. Runoff is medium, and the hazard of water erosion is moderate to high.

The Kim soil is deep and well drained. It formed in eolian fine sand and silt. Typically, the surface layer is light brownish gray loam 8 inches thick. The underlying material to a depth of 60 inches or more is loam. The soil is mildly alkaline to a depth of 8 inches and moderately alkaline below that depth.

Permeability of the Kim soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is high to very high.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture.

The potential plant community on this unit is mainly blue grama. Other grasses that characterize the unit are western wheatgrass and sideoats grama. The average annual production of air-dry vegetation is about 800 pounds per acre. If the condition of the range deteriorates, blue grama, threeawn, and sand dropseed increase. Range seeding is suitable if the range is in poor condition.

If this unit is used for irrigated hay and pasture, the main limitation is slope. Irrigation water can be applied by corrugations or by flooding from contour ditches. Leveling helps to insure the uniform application of water. If properly managed, this unit can produce 4 tons of irrigated alfalfa hay per acre.

This unit is well suited to windbreaks and environmental plantings. The hazard of soil blowing can be reduced by cultivating only in the tree rows and by leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Among the trees that are suitable for planting are Rocky Mountain juniper, ponderosa pine, and Russian-olive. Among the shrubs are plum and lilac.

This unit is suited to homesite development. Revegetating disturbed areas around construction sites as soon as possible helps to control soil blowing. Shrink-swell potential of the Wiley soil is easily overcome by placing footings of buildings below the subsoil layer. Permeability is somewhat restrictive for septic tank absorption fields. This limitation can be overcome by increasing the size of the absorption field.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated. It is in Loamy Plains range site.

92—Willowman gravelly sandy loam, 3 to 8 percent slopes. This deep, well drained soil is on terraces and fans. It formed in cobbly and gravelly alluvium. The native vegetation is mainly grass. Elevation is 6,500 to 7,600 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 130 days.

Typically, the surface layer is brown gravelly sandy loam about 8 inches thick. The subsoil is very cobbly sandy clay loam about 7 inches thick. The upper 6 inches of the substratum is very cobbly sandy loam, the next 23 inches is very gravelly loamy sand, and the lower part to a depth of 60 inches or more is very gravelly sand. The soil is mildly alkaline to a depth of 15 inches. Below this depth, it is moderately alkaline and has large accumulations of calcium carbonate.

Included in this unit is about 15 percent nests of cobbles on the surface. Also included is about 10 percent Noden loam in swales and small depressional areas. The Noden soil has few rock fragments.

Permeability of this Willoman soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate to high.

Most areas of this unit are used as rangeland. A few areas are used for irrigated hay and pasture.

The potential plant community on this unit is mainly sideoats grama, little bluestem, and blue grama. Other grasses that characterize the unit are prairie junegrass and needleandthread. The average annual production of air-dry vegetation is about 1,300 pounds per acre. If the condition of the range deteriorates, sleepygrass, threeawn, yucca, and pricklypear increase. Range seeding is suitable if the range is in poor condition. Seeding using mechanical equipment is feasible in areas where the surface is not cobbly.

If this unit is used for irrigated hay and pasture, the main limitation is the cobbles in the subsoil and, in some areas, at the surface. Seeding should be feasible in most areas, but the cobbles can make plowing difficult. Shallow-rooted crops are best adapted because the substratum is droughty.

Irrigation water can be applied by corrugations, flooding from contour ditches, and sprinklers. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Because subsurface cobbles can be exposed, onsite investigation may be needed before leveling. If properly managed, this unit can produce 3 tons of irrigated grass hay per acre.

This unit is poorly suited to windbreaks and environmental plantings. It is limited mainly by the droughtiness of the substratum.

This unit is well suited to homesite development. The large amount of rock fragments in the soil makes excavation difficult.

This map unit is in capability subclass VIe, irrigated and nonirrigated. It is in Sandy Foothills range site.

93—Willowman gravelly sandy loam, 15 to 30 percent slopes. This deep, well drained soil is on terraces and side slopes. It formed in cobbly and gravelly alluvium. The native vegetation is mainly grass. Elevation is 6,500 to 7,600 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 100 to 130 days.

Typically, the surface layer is brown gravelly sandy loam about 8 inches thick. The subsoil is very cobbly sandy clay loam about 7 inches thick. The upper 4 inches of the substratum is very cobbly sandy loam, the next 25 inches is very gravelly loamy sand, and the lower part to a depth of 60 inches or more is very gravelly sand. The soil is mildly alkaline to a depth of 15 inches. Below this depth, it is moderately alkaline and has large accumulations of calcium carbonate.

Included in this unit is about 15 percent Noden loam near the base of steep terrace slopes. The Noden soil has fewer rock fragments than this Willowman soil. Also included are small areas of Rock outcrop of sandstone and areas of soils that have a cobbly or stony surface.

Permeability of this Willoman soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is very high.

This unit is used as rangeland.

The potential plant community on this unit is mainly big bluestem, little bluestem, needleandthread, and sideoats grama. Other grasses that characterize the unit are western wheatgrass and prairie junegrass. The average annual production of air-dry vegetation is about 1,200 pounds per acre. If the condition of the range deteriorates, sleepygrass, threeawn, skunkbush sumac, and pricklypear increase. If the range vegetation is seriously deteriorated, seeding is needed. The main limitations for seeding are slope and some cobbles in the surface layer.

This unit is poorly suited to homesite development. It is limited mainly by steepness of slope.

This map unit is in capability subclass VIe, nonirrigated. It is in Sandy Foothills range site.

94—Woodhall-Rock outcrop complex, 5 to 20 percent slopes. This map unit is on mountains. The native vegetation is mainly grass. Elevation is 9,000 to 9,600 feet. The average annual precipitation is 20 to 25 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 40 to 60 days.

This unit is about 65 percent Woodhall loam and about 20 percent Rock outcrop. The Woodhall soil and areas of Rock outcrop are throughout the unit. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent deep sandy loam in small drainageways. Also included are small areas of shallow Rogert very gravelly sandy loam near areas of Rock outcrop.

The Woodhall soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from igneous and sedimentary rock. Typically, the surface layer is brown loam about 8 inches thick. The subsoil is very stony clay loam about 9 inches thick. The substratum is extremely cobbly loam about 9 inches thick. Sandstone is at a depth of 26 inches. The soil is neutral throughout.

Permeability of the Woodhall soil is moderate. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is very high.

Rock outcrop consists of isolated low projections of sandstone or igneous rock.

This unit is used as summer range.

The potential plant community on this unit is mainly Thurber fescue and Parry oatgrass. Other grasses that characterize the unit are Arizona fescue, needlegrasses, and big bluegrass. The average annual production of air-dry vegetation is about 2,500 pounds per acre. If the condition of the range deteriorates, blue grama, slimstem muhly, Kentucky bluegrass, forbs, and woody shrubs increase. Range seeding using mechanical equipment is limited to areas away from Rock outcrop. Livestock grazing should be managed to protect the unit from excessive erosion.

If this unit is used for homesite development, the main limitations are areas of Rock outcrop and the high content of stones and cobbles in the soil, which makes excavation difficult.

This map unit is in capability subclass VIe, nonirrigated. It is in Subalpine Loam range site.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

hay and pasture

General management needed for hay and pasture is suggested in this section. The hay or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; prime farmland is defined and the map units are listed that qualify as prime farmland if irrigated; the system of land capability classification used by the Soil Conservation Service is explained; and the estimation of yields of the main crops and hay and pasture plants is discussed.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Nearly all of the irrigated soils in the survey area are used for pasture and hay because of the limited supply of water and the short growing season in the mountains and foothills.

Where fields of permanent grass for hay or pasture are renovated or plowed, the soils commonly are seeded to oats or barley. This gives the sod time to decompose, and the soil surface can be smoothed before reseeding. Growing oats or barley for 1 or 2 years also helps to control undesirable grasses and weeds while giving some production.

Fertilizers, especially nitrogen and phosphorus, are needed for highly productive meadows and pasture. Nitrogen can be applied annually to maintain plant vigor and composition throughout the life of the planting. It can be used in years when adequate moisture is available. Phosphorus, especially needed for clover or alfalfa, should be applied during seedbed preparation or prior to seeding.

The most successful plantings for pasture and hay are made in well-prepared, firmly packed soil. If water is available, seeding in August and September reduces the growth of weeds and shortens the time required for establishing plantings. Where water for fall irrigation is not available, seeding can be done in spring. Smoothing of the soil surface helps to control the application of irrigation water. Good, clean stubble makes an almost ideal seedbed that generally requires no special treatment.

On wet, saline or alkaline soils, Jose tall wheatgrass, alkali sacaton, reed canarygrass, and western Dutch clover can be seeded for pasture and hay.

On the plains and foothills, intermediate wheatgrass, pubescent wheatgrass, Saratoga brome, smooth brome, and Alta tall fescue can be seeded for pasture and hay. Small amounts of yellow or white clover can be seeded with these grasses. Alfalfa and mixtures of alfalfa and grasses are suited to these areas.

On the mountains, redtop, orchardgrass, timothy, and smooth brome can be seeded for hay and pasture. Mixtures of alsike clover and grasses are also suitable.

Grass and grass-legume pasture requires proper use and management for good production. The height of the

stubble or leaf generally determines when a pasture is ready for use or when it is time to curtail or rotate use. Pasture plants should be at least 8 inches tall before grazing is started. Stubble 4 inches tall should be left at all times to help maintain healthy, productive plants and reduce thinning and winterkill. This practice also minimizes erosion and helps to evenly distribute irrigation water. Dragging, smoothing, renovating, and overseeding are used to maintain smooth pastures and meadows and to maintain good plant composition. Drilling the seed with a grass or grain drill at a depth of about one-half inch improves the stand.

Irrigation water management includes irrigating without excessive erosion and according to crop needs and the soil's ability to receive and store water. Pasture and hay generally are irrigated by corrugations or by controlled flooding from gradient laterals placed at regular intervals on the slope.

Where slopes are nearly level and are more nearly uniform, border irrigation is one of the more efficient methods of applying irrigation water. Because the water is flooded between small dikes extending across the field, this method requires a relatively large flow of water. The actual amount depends on the width and length of the borders and the water intake rate of the soil.

Any type of "on-off" irrigation is superior to the continuous-flow irrigation method used on some meadow soils. When the soil is not being irrigated, it has a chance to aerate and warm up, which encourages the growth of preferred grasses. With proper irrigation methods and better plant composition, the pastures and meadows respond to fertilizer and proper grazing use and become consistently more productive. Leveling or land smoothing, weed control, and the use of irrigation pipelines, checks, drops, turnouts, and diversions may be needed.

prime farmland

Prime farmland, as defined by the United States Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It must either be used for producing food or fiber or be available for these uses. It has the soil quality, length of growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is managed properly. Prime farmland produces the highest yields with minimal energy and economic resources, and farming it results in the least disturbance of the environment.

Prime farmland commonly has an adequate and dependable supply of moisture from precipitation or irrigation. It also has a favorable temperature and length of growing season and an acceptable level of acidity or alkalinity. It has few if any rock fragments and is permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods and is not flooded during the growing season. The slope is no more than 6 percent. Soils that are limited by a high water table, the hazard of flooding, or inadequate rainfall may qualify for prime farmland if these limitations can be overcome by practices such as drainage, flood control, or irrigation.

About 6,000 acres, or less than 1 percent of the survey area, meets the requirements for prime farmland. Areas must be irrigated to qualify for prime farmland in this survey area and, for the most part, are along major streams. Nearly all of the acreage is irrigated hayland.

Areas of the following map units that have slopes of 6 percent or less meet the soil requirements for prime farmland. This list does not constitute a recommendation for a particular land use.

2—Baca loam, 1 to 3 percent slopes
17—Fort Collins loam, 1 to 3 percent slopes
22—Glenberg sandy loam
24—Haverson clay loam
40—Manvel silty clay loam, 1 to 5 percent slopes
43—Manzano loam
44—Manzanola clay loam, 0 to 2 percent slopes
50—Neville fine sandy loam, 1 to 3 percent slopes
52—Noden sandy loam, 1 to 8 percent slopes
54—Noden loam, 1 to 9 percent slopes
57—Nunn loam, 0 to 3 percent slopes
64—Patent loam, 2 to 8 percent slopes
67—Potts sandy loam, 1 to 8 percent slopes
86—Vona fine sandy loam, 1 to 5 percent slopes
90—Wiley loam, 1 to 3 percent slopes

yields per acre

For each map unit that is used for crop production, the average yields per acre that can be expected of the principal crops under a high level of management are given in the section "Detailed soil map units". In any given year, yields may be higher or lower than those indicated in the map units because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops

grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the map units are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*20*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed soil map units."

rangeland

Most of the ranching operations in the survey area are under a year-round grazing program. In winter the native forage is often supplemented by hay and protein concentrate. In some areas, principally along the river bottoms and major creeks, range is used along with irrigated hay.

The properties of soils strongly influence the kind of natural vegetation that grows on them. The soils on low stream terraces that are poorly drained support water-tolerant plants such as saltgrass, sedges, and rushes. Production in these areas is high. The soils on plains are calcareous. These soils support short, warm-season grasses such as blue grama.

The soils on foothills formed under the influence of a cooler climate and higher precipitation than the soils on the plains. Thus, the surface layer is darker colored and carbonates are leached from the upper layers of these soils. Cool-season grasses such as needleandthread and western wheatgrass are common on foothills.

The soils on mountains formed under the influence of a colder climate and higher precipitation than the soils on foothills. Thus, the surface layer is darker colored and carbonates commonly have been leached to a greater depth. Cool-season midgrasses and tall grasses such as Arizona fescue, mountain muhly, Parry oatgrass, and mountain brome are typical plants on mountains.

Proper grazing use is the major management concern on rangeland. Control of grazing is needed so that the kinds and amounts of plants that make up the potential plant community are reestablished and maintained. To achieve this, 50 percent of the season's growth of selected key species should remain at the end of the growing season.

Deferred grazing or the application of planned grazing systems improves the condition of the range. Deferred

grazing is delaying grazing until the seed of key forage plants is mature or nearly mature. Grazing should be rotated among all pastures to benefit an entire area of rangeland. Well planned grazing systems allow for more uniform use of all native forage plants. Rotation grazing allows key plants to achieve the desired growth prior to being grazed and allows the plants to mature and to develop mature seed. Fencing, properly locating watering areas, and distributing salt blocks are important management practices for obtaining more uniform distribution of grazing.

Rangeland furrowing, chiseling, or pitting to reduce runoff and erosion improve water intake and enhance recovery of vegetation. These practices can be used in areas of range that are in poor or fair condition, primarily in Loamy Plains, Loamy Foothills, Loamy Park, and Mountain Loam range sites. To prevent further erosion and to further enhance range recovery, erosion control dams and diversions are needed in some areas of badly deteriorated and gullied rangeland.

Range seeding may be needed to improve some areas of badly deteriorated rangeland. Seedings can be done in conjunction with range pitting, or the seed can be planted into a prepared seedbed. The best time for seeding varies, depending on the location of the soil in the survey area and the type of grass to be seeded.

On the plains, April 15 to May 15 generally is the best time to seed warm-season grasses. Fall seeding of warm-season grasses should be delayed until well after frost to insure that the seed will not germinate before spring.

In the foothills, cool-season grasses are most productive. The best time for seeding these grasses generally is from late in spring to early in summer, or from May 15 to July 15. Fall seeding of cool-season grasses generally is most successful from August 1 to September 1.

In the mountains, cool-season grasses are most productive. The best stands generally are obtained by seeding between June 15 and July 15.

Brush control is beneficial in areas where competitive shrubs have increased beyond the amount normally in the potential plant community.

Use of proper range management based on soil survey information and rangeland inventories can increase the productivity of the rangeland in the survey area.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

For each soil in the survey area that is suited to rangeland, the range site, the total annual production of vegetation in normal years, and the characteristic vegetation are given in the section "Detailed soil map units" (*5*).

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for a normal year when growing conditions are about average.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

woodland management and productivity

Woodland makes up about 31 percent of the survey area. Productive woodland that supports commercial species occupies about 7 percent of the area. This woodland generally is adjacent to the San Isabel National Forest and in the Sangre de Cristo Mountains. It is along the Costilla County line, northwest and south of La Veta Pass. Noncommercial woodland that supports mostly pinyon and oneseed juniper is on mesas, fans, and the sides of foothills. It makes up about 24 percent of the survey area.

Much of the acreage of commercial woodland is considered to be of low commercial value. The form,

shape, and growth rate of the trees are such that intensive management to produce wood crops is not practical. Long-term management, such as thinning, is not financially feasible; therefore, any management practice applied to woodland in this survey area should be self-sustaining. The best fiber production is on the Larkson, Loberg, and Maitland soils.

Logging and fires in the early days of settlement had a significant influence on the composition of stands of timber in the survey area. The harvesting practices used depleted the growing stock in the forest and left an imbalance of mostly overmature sawtimber, saplings, and pole-sized material. Early fires left many acres under stands of aspen. Many of these sites generally are considered to be nonproductive as woodland; however, they are valuable as seasonal range.

Many forest pathogens are in the survey area. Spruce budworm has been noted in the area since 1938. This insect defoliates Engelmann spruce, white fir, and Douglas-fir. The Great Basin tent caterpillar eats the foliage of aspen; if the aspen is defoliated during several consecutive seasons, it may be sufficiently weakened to succumb to some other woodland insect. The mountain pine beetle is the major insect pest associated with ponderosa pine. These insects kill trees by eating out tunnels under the bark and girdling the trees.

The native woodland in the survey area can be divided into several forest types—pinyon-juniper, ponderosa pine, Douglas-fir, and lodgepole pine (*13*).

The *pinyon-juniper* forest type is the most extensive in the survey area. It is on the foothills at an elevation of 6,400 to 8,500 feet and on steep, south-facing slopes of mountains at an elevation of up to 9,300 feet. Pinyon generally predominates throughout the area. Juniper is most common on the limestone and sandstone breaks of the plains. On favorable sites, this forest type forms a dense cover and the trees reach 20 to 30 feet in height. On drier sites in and around Huerfano Park, the space between trees is wider and the trees are smaller.

This forest type is used for firewood, fenceposts, and Christmas trees. Use of chaining to promote the growth of herbaceous plants is best accomplished in areas where the soils are deep and gently sloping. Areas of the Brownsto, Progresso, and Schambers soils and associated deep soils are suitable for chaining.

This forest type is mainly on the Louviers, Travessilla, Farisita, Bond, Castner, and Brownsto soils and on Torriorthents.

The *ponderosa pine* forest type is throughout the western half of the survey area at an elevation of 7,000 to 9,000 feet. Many of these stands were logged for mine props and railroad ties in the early days of mining. Thus, many of the better sites need to be thinned. Many of the older, uncut stands are susceptible to attack from mountain pine beetles or are infested with dwarf mistletoe.

This forest cover is used for sawtimber, mine props, railroad ties, and fenceposts. The principal management needed is protection from fire, insects, and disease. The older, larger trees should be harvested to provide maximum protection from insects and disease. Many areas have an aggressive understory of Gambel oak that can inhibit pine regeneration for years.

This forest type is mainly on the Larkson, Wetmore, Maitland, and Wahatoya soils.

The *Douglas-fir* forest type is nearly as extensive as the *ponderosa pine* type. This type commonly has large amounts of white fir and ponderosa pine associated with it. It generally is on mountains. It is on steep, north-facing slopes at an elevation of 7,500 to 9,000 feet and on steep, south-facing slopes at an elevation of more than 8,000 feet. Extensive stands of mixed aspen and fir, mostly on Montez soils, are included in this forest type.

Douglas-fir is the most valuable tree in the survey area. Good quality construction lumber is the dominant product; however, most of the stands of Douglas-fir in the survey area are of poor quality. Sawtimber can be harvested, but it is unlikely that a subsequent sawtimber crop could be harvested within 150 years.

This forest type is on the Uinta, Lakehelen, Mortenson, and Montez soils.

The *lodgepole pine* forest type is the least extensive in the survey area. This type is dominated by lodgepole pine, but it contains varying amounts of Englemann spruce, subalpine fir, and aspen. The lodgepole pine forest type is on broad rolling uplands at an elevation of more than 9,000 feet.

The lodgepole pine forest type is a subclimax plant community that eventually becomes a spruce-fir forest type. This change occurs very slowly. Because of this transition from one type to another, stands may contain degrees of the two forest types from pure lodgepole pine to stands of spruce-fir with only a few lodgepole pine in the canopy.

This forest type is used for sawtimber and other wood products. It is mainly on the Uinta and Lakehelen soils.

For each map unit suitable for wood crop production, interpretations for the appropriate woodland site is given in the section "Detailed soil map units" (*8*).

Additional information on harvesting and reforestation and assistance in forest land planning is available through the local office of the Colorado State Forest Service.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

For each map unit that is suited to windbreaks and environmental plantings, suitable management practices and the trees and shrubs that are suitable for planting are given in the section "Detailed soil map units." Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

The soils of the survey area are rated in table 5 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 5, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 5 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 8 and interpretations for dwellings without basements and for local roads and streets in table 7.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 6, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are

very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are alta fescue, bromegrass, yellow clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are big bluestem, sunflower, kochia, western wheatgrass, and blue grama.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, pinyon, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, and fourwing saltbush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are kochia, alkali bluegrass, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, band-tailed pigeon, thrushes, woodpeckers, squirrels, gray fox, raccoon, mule deer, elk, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, raccoon, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, burrowing owl, prairie dog, scaled quail, meadowlark, lark bunting, kit fox, and plains rattlesnake.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section (*11*).

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution,

liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills and septic tank absorption fields; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 7 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

sanitary facilities

Table 8 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoon areas, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 8 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe (*24*). Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoon areas are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 8 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 8 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 9 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil

after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 9, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 10 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a

depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction (*19*).

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed (*21*). During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 11 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 12 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly

erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 12, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 13 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 13 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 13 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table

that is seasonally high for less than 1 month is not indicated in table 13.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*22*). 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. In table 14, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten 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 Entisol.

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

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that have an aquic moisture regime).

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

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquolls.

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

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other 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 (*18*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*22*). 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 of each soil series are described in the section "Detailed soil map units."

Apishapa series

The Apishapa series consists of deep, poorly drained soils on flood plains and alluvial fans. These soils formed in alluvium derived from shale. Slope is 0 to 2 percent. The average annual precipitation is 13 to 15 inches, and the average annual air temperature is 50 to 54 degrees F.

These soils are fine, montmorillonitic (calcareous), mesic Vertic Fluvaquents.

Typical pedon of Apishapa silty clay, 100 feet north and 100 feet east of the southwest corner of sec. 36, T. 27 S., R. 66 W.

A1—0 to 6 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; common fine faint yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; very hard, firm, sticky and plastic; common fine salt crystals; calcareous; moderately alkaline; clear smooth boundary.

C1casa—6 to 24 inches; grayish brown (2.5Y 5/2) silty clay, dark grayish brown (2.5Y 4/2) moist; common fine faint dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; very hard, firm, sticky and plastic; abundant fine salt crystals; calcareous; moderately alkaline; clear wavy boundary.

C2cacsg—24 to 60 inches; grayish brown (2.5Y 5/2) silty clay, dark gray (5Y 4/1) moist; common medium distinct light yellowish brown (2.5Y 6/4) mottles; massive; very hard, firm, sticky and plastic; calcareous; strongly alkaline.

A fluctuating water table is at a depth of 1 foot to 3 feet. The control section is slightly saline or moderately saline. It is silty clay or clay and is 40 to 60 percent clay. It is moderately alkaline or strongly alkaline. The A1 horizon is grayish brown or light brownish gray. The C horizon is grayish brown, dark grayish brown, light olive brown, or olive brown.

Baca series

The Baca series consists of deep, well drained soils on uplands. These soils formed in calcareous loess. Slope is 1 to 3 percent. The average annual precipitation is 13 to 15 inches, and the average annual air temperature is 50 to 54 degrees F.

These soils are fine, montmorillonitic, mesic Ustollic Haplargids.

Typical pedon of Baca loam, 1 to 3 percent slopes, 2,400 feet south and 2,200 feet west of the northeast corner of sec. 7, T. 28 S., R. 65 W.

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

B1—3 to 6 inches; brown (10YR 5/3) clay loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B21t—6 to 11 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to moderate fine blocky; hard, friable, sticky and plastic; thin continuous clay films on peds; mildly alkaline; clear wavy boundary.

B22tca—11 to 23 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; moderate coarse prismatic structure parting to strong medium blocky; hard, friable, sticky and plastic; thin continuous clay films on vertical faces of peds; few fine and medium distinct filaments and soft masses of lime; calcareous; mildly alkaline; gradual wavy boundary.

B3ca—23 to 30 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate coarse subangular blocky structure; slightly hard, very friable, sticky and plastic; common fine and medium distinct filaments and soft masses of lime; calcareous; moderately alklaline; gradual wavy boundary.

Cca—30 to 60 inches; yellowish brown (10YR 5/4) loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; calcareous; moderately alkaline.

Depth to calcareous material ranges from 8 to 20 inches. The A1 horizon is brown, pale brown, or grayish brown. It is neutral or mildly alkaline. The B2t horizon is light yellowish brown, yellowish brown, or brown. It is clay, silty clay loam, or clay loam and is mildly alkaline or moderately alkaline. The Cca horizon is pale brown, yellowish brown, or brown. It is loam or silt loam.

Badito series

The Badito series consists of moderately deep, well drained soils on south-facing mountainsides. These soils formed in residuum and colluvium derived from conglomerate and sandstone. Slope is 25 to 60 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 40 to 44 degrees F.

These soils are loamy-skeletal, mixed aridic Argiborolls.

Typical pedon of Badito very cobbly sandy loam, 25 to 60 percent slopes, 100 feet north and 500 feet west of the southeast corner of sec. 3, T. 25 S., R. 71 W.

A11—0 to 3 inches; dark grayish brown (10YR 4/2) very cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; 25 percent cobbles and 30 percent gravel; neutral; abrupt smooth boundary.

A12—3 to 7 inches; dark grayish brown (10YR 4/2) very cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; soft, friable, slightly sticky and nonplastic; 20 percent cobbles and 30 percent gravel; neutral; abrupt smooth boundary.

B1—7 to 11 inches; brown (10YR 5/2) very gravelly sandy clay loam, dark brown (7.5YR 4/2) moist; moderate fine subangular blocky structure; hard, firm, slightly sticky and slightly plastic; 5 percent cobbles and 50 percent gravel; neutral; clear smooth boundary.

B2t—11 to 16 inches; brown (7.5YR 5/2) very gravelly sandy clay loam, dark brown (7.5YR 4/2) moist; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; 10 percent cobbles and 50 percent gravel; common thin clay films on peds; neutral; clear wavy boundary.
C1—16 to 35 inches; brown (7.5YR 5/2) very gravelly sandy loam, dark brown (7.5YR 4/2) moist; massive; slightly hard, very firm, nonsticky and nonplastic; 10 percent cobbles and 30 percent gravel; neutral; gradual wavy boundary.
C2r—35 to 43 inches; light brown (7.5YR 6/4) soft conglomeritic tuff; mildly alkaline; clear wavy boundary.
R—43 inches; hard sandstone.

Soft bedrock is at a depth of 20 to 40 inches. Hard sandstone is at a depth of 40 to 60 inches. The A horizon is grayish brown, dark grayish brown, brown, or dark brown. The B horizon is brown or dark brown. It is very cobbly loam, very cobbly clay loam, or very gravelly sandy clay loam. It is 35 to 60 percent rock fragments. The C horizon is calcareous in some pedons. It is neutral or mildly alkaline.

Bayerton series

The Bayerton series consists of moderately deep, well drained soils on mountainsides. These soils formed in residuum derived from sandstone. Slope is 25 to 50 percent. The average annual precipitation is 18 to 23 inches, and the average annual air temperature is 42 to 47 degrees F.

These soils are fine-loamy, mixed Typic Eutraboralfs.

Typical pedon of a Bayerton cobbly sandy loam in an area of Bayerton-Maitland complex, 25 to 50 percent slopes, 1,300 feet east and 600 feet north of the southwest corner of sec. 10, T. 30 S., R. 67 W.

O1—1 inch to 0; undecomposed forest litter, principally needles and leaves.
A1—0 to 3 inches; brown (7.5YR 4/2) cobbly sandy loam, dark brown (7.5YR 3/2) moist; strong fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; 20 percent cobbles and 5 percent gravel; neutral; abrupt smooth boundary.
A2—3 to 6 inches; pinkish gray (7.5YR 6/2) sandy loam, brown (7.5YR 5/2) moist; weak very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; neutral; abrupt smooth boundary.
B21t—6 to 19 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, very friable, sticky and plastic; common thin clay films on peds; neutral; clear wavy boundary.
B22t—19 to 28 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; thin continuous clay films on vertical faces of peds; neutral; gradual wavy boundary.
B3—28 to 32 inches; light brown (7.5YR 6/4) gravelly sandy clay loam, brown (7.5YR 4/4) moist; moderate coarse subangular blocky structure; very hard, friable, sticky and plastic; 20 percent gravel; neutral; clear wavy boundary.
R—32 inches; sandstone.

Bedrock is at a depth of 20 to 40 inches. The A2 horizon is pale brown, light brown, or pinkish gray. It is cobbly sandy loam or sandy loam. The B horizon is light brown, brown, or pale brown. It is sandy clay loam or gravelly sandy clay loam.

The Bayerton soils in this survey area are a taxadjunct to the Bayerton series because they are noncalcareous throughout the profile. This difference, however, does not significantly affect use and management.

Benteen series

The Benteen series consists of moderately deep, well drained soils on mountaintops and benches. These soils formed in residuum and colluvium derived from sandstone and slate. Slope is 3 to 18 percent. The average annual precipitation is 17 to 22 inches, and the average annual air temperature is 38 to 42 degrees F.

These soils are fine-loamy, mixed Argic Pachic Cryoborolls.

Typical pedon of a Benteen loam in an area of Benteen-Rock outcrop complex, 3 to 18 percent slopes, in an unsectionalized area about 2.5 miles west of the Chama Church, T. 27 S., R. 71 W.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak platy structure; soft, friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.
A3—3 to 6 inches; dark brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.
B22t—6 to 20 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; many thin clay films on peds; few soft masses of lime; mildly alkaline; gradual wavy boundary.
B3ca—20 to 24 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 10 percent gravel; calcareous; mildly alkaline; clear irregular boundary.
C1—24 to 30 inches; brown (10YR 5/3) very gravelly loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky and slightly

plastic; 30 percent gravel and 10 percent cobbles; calcareous; mildly alkaline; clear irregular boundary.
R—30 inches; hard fractured shale.

Depth to bedrock ranges from 20 to 40 inches. The profile commonly is noncalcareous to a depth of more than 20 inches. It is neutral to moderately alkaline. The A horizon is dark grayish brown or grayish brown. The B horizon is brown, dark brown, yellowish brown, or dark yellowish brown. It is 0 to 15 percent rock fragments. The C horizon is yellowish brown, brown, or grayish brown. It is gravelly loam or very gravelly loam and is 15 to 40 percent rock fragments.

Bond series

The Bond series consists of shallow, well drained soils on long, narrow ridges and foot slopes. These soils formed in residuum derived from sandstone. Slope is 2 to 25 percent. The average annual precipitation is about 14 to 18 inches, and the average annual air temperature is 47 to 54 degrees F.

These soils are loamy, mixed, mesic Lithic Ustollic Haplargids.

Typical pedon of a Bond sandy loam in an area of Noden-Bond sandy loams, 2 to 18 percent slopes, 2,500 feet east and 1,500 feet south of the northwest corner of sec. 33, T. 29 S., R. 66 W.

A1—0 to 4 inches; brown (7.5YR 5/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; neutral; clear smooth boundary.
B2t—4 to 9 inches; dark brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; neutral; gradual wavy boundary.
B3—9 to 17 inches; reddish yellow (7.5YR 6/6) sandy clay loam, dark brown (7.5YR 4/4) moist; massive; extremely hard, very friable, slightly sticky and slightly plastic; 60 percent soft weathered sandstone; neutral; gradual wavy boundary.
R—17 inches; sandstone.

Depth to bedrock ranges from 12 to 20 inches. The A1 horizon is brown or dark brown. It is sandy loam or loam. The B horizon is dark brown, brown, or reddish yellow. It is neutral or mildly alkaline and is 5 to 20 percent rock fragments.

Breece series

The Breece series consists of deep, well drained soils in drainageways and on foot slopes. These soils formed in alluvium and colluvium. Slope is 2 to 18 percent. The average annual precipitation is 20 to 25 inches, and the average annual air temperature is 40 to 45 degrees F.

These soils are coarse-loamy, mixed Pachic Haplaborolls.

Typical pedon of Breece sandy loam, 2 to 18 percent slopes, 2,300 feet south and 1,900 feet east of the northwest corner of sec. 36, T. 28 S., R. 70 W.

A1—0 to 14 inches; dark grayish brown (10YR 4/2) sandy loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; slightly hard, very friable, nonsticky and slightly plastic; 10 percent gravel; neutral; gradual wavy boundary.
AC—14 to 33 inches; brown (7.5YR 5/2) sandy loam, dark brown (7.5YR 3/2) moist; weak coarse subangular blocky structure; hard, very friable, nonsticky and slightly plastic; 15 percent gravel; neutral; gradual wavy boundary.
C—33 to 60 inches; brown (7.5YR 5/4) gravelly sandy loam, dark brown (7.5YR 4/4) moist; massive; hard, very friable, nonsticky and nonplastic; 20 percent gravel; neutral.

The mollic epipedon ranges from 16 to 50 inches in thickness. It is dark grayish brown, dark gray, or very dark grayish brown. The C horizon is brown or dark brown.

Brownsto series

The Brownsto series consists of deep, well drained soils on fans, mountainsides, and foot slopes below areas of Rock outcrop. These soils formed in alluvium and colluvium. Slope is 3 to 75 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 42 to 44 degrees F.

These soils are loamy-skeletal, mixed Borollic Calciorthids.

Typical pedon of Brownsto very channery loam, 15 to 75 percent slopes, 2,100 feet north and 600 feet east of the southwest corner of sec. 9, T. 27 S., R. 68 W.

A1—0 to 4 inches; grayish brown (10YR 5/2) very channery loam, dark grayish brown (10YR 4/2) moist; moderate very fine granular structure; slightly hard, friable, sticky and plastic; 50 percent channery fragments; calcareous; mildly alkaline; clear smooth boundary.
B21—4 to 7 inches; yellowish brown (10YR 5/4) very gravelly sandy clay loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; 10 percent cobbles and 25 percent gravel; calcareous; moderately alkaline; clear wavy boundary.
B22—7 to 17 inches; yellowish brown (10YR 5/6) very gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; very hard, firm, sticky and plastic; 10 percent cobbles and 30 percent gravel; calcareous; moderately alkaline; abrupt wavy boundary.

C1ca—17 to 32 inches; very pale brown (10YR 7/3) very gravelly sandy clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 40 percent gravel; thick lime coatings on bottom of pebbles; 39 percent calcium carbonate equivalent; calcareous; moderately alkaline; gradual wavy boundary.
C2ca—32 to 60 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; 10 percent cobbles and 55 percent gravel; heavy lime coatings on bottom of cobbles and pebbles; 27 percent calcium carbonate equivalent; calcareous; moderately alkaline.

The depth to uniformly calcareous material is 12 to 20 inches. The A1 horizon is grayish brown or brown. It is mildly alkaline or moderately alkaline. The C horizon averages 35 to 75 percent angular rock fragments. The fine earth fraction is sandy loam or sandy clay loam but averages sandy loam.

Cascajo series

The Cascajo series consists of excessively drained soils on terraces. These soils formed in coarse textured alluvium. Slope is 1 to 12 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 48 to 52 degrees F.

These soils are sandy-skeletal, mixed, mesic Ustollic Calciorthids.

Typical pedon of a Cascajo loam in an area of Kim-Cascajo complex, 1 to 12 percent slopes, 2,500 feet north and 1,400 feet west of the southeast corner of sec. 25, T. 26 S., R. 69 W.

A1—0 to 5 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 5 percent cobbles and 15 percent gravel; calcareous; mildly alkaline; clear smooth boundary.
AC—5 to 11 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; 5 percent stones, 5 percent cobbles, and 15 percent gravel; 5 percent calcium carbonate; moderately alkaline; gradual wavy boundary.
C1ca—11 to 20 inches; very pale brown (10YR 8/3) very gravelly sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 5 percent stones, 10 percent cobbles, and 25 percent gravel; 28 percent calcium carbonate; calcareous; moderately alkaline; clear wavy boundary.
C2—20 to 60 inches; light brown (7.5YR 6/4) very gravelly loamy sand, brown (7.5YR 5/4) moist; single grain; loose; 5 percent stones, 10 percent cobbles, and 40 percent gravel; 12 percent calcium carbonate; moderately alkaline.

The 10- to 40-inch control section averages 35 to 80 percent rock fragments. The A horizon is pale brown or brown. It is mildly alkaline or moderately alkaline. The C horizon is pale brown, very pale brown, light brown, or brown.

Castner series

The Castner series consists of shallow, well drained soils on side slopes and ridges. These soils formed in residuum and colluvium derived from interbedded siltstone and sandstone and from shale. Slope is 20 to 70 percent. The average annual precipitation is 13 to 16 inches, and the average annual air temperature is 42 to 46 degrees F.

These soils are loamy-skeletal, mixed Lithic Haploborolls.

Typical pedon of Castner very channery loam, 20 to 70 percent slopes, in an unsectionalized area about 1.3 miles west and 2,800 feet south of Chama Church, T. 27 S., R. 71 W.

A11—0 to 3 inches; dark grayish brown (10YR 4/2) very channery loam, very dark brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; 50 percent channery fragments; calcareous; mildly alkaline; clear smooth boundary.
A12—3 to 11 inches; dark grayish brown (10YR 4/2) extremely channery loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 75 percent channery fragments; calcium carbonate on surface of rock fragments; calcareous; mildly alkaline; abrupt irregular boundary.
R—11 inches; gray siltstone with calcium carbonate on surface along rock fractures.

Depth to bedrock ranges from 6 to 20 inches. Depth to uniformly calcareous material is 0 to 5 inches. The A1 horizon is grayish brown, dark grayish brown, brown, or dark brown. It is 35 to 75 percent rock fragments and is neutral or mildly alkaline. The Cca horizon, where present, is pale brown, light brown, or light yellowish brown. It is mildly alkaline or moderately alkaline.

Coldcreek series

The Coldcreek series consists of deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from interbedded sandstone and siltstone. Slope is 25 to 80 percent. The average annual precipitation is 20 to 25 inches, and the average annual air temperature is 38 to 44 degrees F.

These soils are loamy-skeletal, mixed Typic Paleboralfs.

Typical pedon of Coldcreek cobbly sandy loam, 25 to 80 percent slopes, 2,500 feet west and 400 feet north of the southeast corner of sec. 17, T. 30 S., R. 67 W.

O1—2 inches to 1 inch; undecomposed organic material, principally needles, bark, and twigs.
O2—1 inch to 0; partially decomposed organic material, principally needles, bark, and twigs.
A2—0 to 14 inches; light brownish gray (10YR 6/2) cobbly sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; 10 percent gravel, 5 percent cobbles, and 2 percent stones; slightly acid; gradual wavy boundary.
A&B—14 to 25 inches; mixed very pale brown (10YR 7/3) and pale brown (10YR 6/3) very cobbly sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few clay films bridging mineral grains; 20 percent gravel, 20 percent cobbles, and 2 percent stones; medium acid; gradual wavy boundary.
B&A—25 to 37 inches; mixed pale brown (10YR 6/3) and very pale brown (10YR 7/3) very cobbly sandy clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common thin clay films on peds; 20 percent gravel, 30 percent cobbles, and 10 percent stones; medium acid; gradual irregular boundary.
B2t—37 to 50 inches; variegated light yellowish brown (10YR 6/4) and dark yellowish brown (10YR 4/4) very cobbly clay loam, yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; 20 percent gravel, 30 percent cobbles, and 10 percent stones; medium acid; clear irregular boundary.
Cr—50 to 60 inches; soft interbedded sandstone and siltstone.

Depth to bedrock is 40 to 60 inches. The A2 horizon is gray, light gray, or light brownish gray. The A&B horizon is very pale brown, pale brown, or brown. It is very cobbly sandy loam or very gravelly sandy loam and is slightly acid or medium acid. The B&A horizon is very pale brown, pale brown, brown, or light yellowish brown. It is 35 to 80 percent rock fragments and is slightly acid or medium acid.

Collegiate series

The Collegiate series consists of deep, somewhat poorly drained soils on flood plains and low terraces. These soils formed in alluvium. Slope is 1 to 3 percent. The average annual precipitation is 18 to 25 inches, and the average annual air temperature is 40 to 45 degrees F.

These soils are coarse-loamy over sandy or sandy-skeletal, mixed, frigid Cumulic Haplaquolls.

Typical pedon of Collegiate loam, 1 to 3 percent slopes, 1,200 feet west and 1,300 feet north of the southeast corner of sec. 9, T. 31 S., R. 69 W.

A11—0 to 14 inches; dark grayish brown (10YR 4/2) loarn, very dark brown (10YR 2/2) moist; moderate medium crumb structure; slightly hard, very friable, nonsticky and nonplastic; neutral; clear smooth boundary.
A12—14 to 21 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; neutral; gradual smooth boundary.
A13g—21 to 31 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; common fine distinct strong brown (7.5YR 5/6) moist mottles; weak medium and coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; 5 percent gravel; neutral; clear wavy boundary.
IICg—31 to 60 inches; very gravelly sand; common large prominent mottles; neutral.

Thickness of the dark-colored horizon ranges from 24 to 40 inches. The profile is noncalcareous to a depth of 40 inches or more. The A horizon is dark grayish brown or grayish brown. The IIC horizon is neutral or mildly alkaline. It is 30 to 65 percent rock fragments.

Coutis series

The Coutis series consists of deep, well drained soils on fans and terraces. These soils formed in colluvium and alluvium. Slope is 5 to 15 percent. The average annual precipitation is 18 to 23 inches, and the average annual air temperature is 42 to 45 degrees F.

These soils are coarse-loamy, mixed Pachic Cryoborolls.

Typical pedon of a Coutis sandy loam in an area of Libeg-Coutis complex, 5 to 15 percent slopes, 100 feet south and 50 feet west of the northeast corner of sec. 34, T. 26 S., R. 72 W.

A11—0 to 10 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; 10 percent gravel; neutral; gradual smooth boundary.
A12—10 to 32 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, very friable, nonsticky and nonplastic; 5 percent gravel; neutral; gradual smooth boundary.

C1—32 to 50 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; neutral; clear irregular boundary.
C2—50 to 60 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; 30 percent gravel and 10 percent cobbles; neutral.

The dark-colored A horizon is 16 to 40 inches thick. It is dark grayish brown, grayish brown, brown, or dark brown. The C horizon is brown, yellowish brown, dark brown, or dark yellowish brown.

Crooked Creek series

The Crooked Creek series consists of deep, poorly drained soils on flood plains and terraces. These soils formed in clayey alluvium. Slope is 0 to 2 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 42 to 45 degrees F.

These soils are fine, montmorillonitic, frigid Cumulic Haplaquolls.

Typical pedon of Crooked Creek silty clay loam, 2,600 feet south and 50 feet east of the northwest corner of sec. 23, T. 26 S., R. 70 W.

A11—0 to 3 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; strong medium granular structure parting to strong fine granular; hard, firm, sticky and plastic; mildly alkaline; clear smooth boundary.
A12—3 to 7 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; mildly alkaline; gradual smooth boundary.
C1—7 to 19 inches; dark gray (10YR 4/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; mildly alkaline; clear smooth boundary.
C2ca—19 to 45 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; calcareous; moderately alkaline; gradual smooth boundary.
C3g—45 to 60 inches; light gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; massive; hard, firm, slightly sticky and slightly plastic; calcareous; moderately alkaline.

A seasonal water table is at a depth of 1 foot to 2.5 feet. The A horizon is dark gray or very dark gray. The C horizon is mildly alkaline or moderately alkaline.

Curecanti series

The Curecanti series consists of deep, well drained soils on fans, terraces, and side slopes. These soils formed in mixed alluvium. Slope is 2 to 8 percent. The average annual precipitation is 15 to 17 inches, and the average annual air temperature is 42 to 45 degrees F.

These soils are loamy-skeletal, mixed Typic Argiborolls.

Typical pedon of Curecanti very cobbly loam, 2 to 8 percent slopes, 2,500 feet west of the southeast corner of sec. 32, T. 29 S., R. 68 W.

A1—0 to 15 inches; dark reddish gray (5YR 4/2) very cobbly loam, dark reddish brown (5YR 3/2) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 25 percent cobbles and 35 percent gravel; neutral; clear wavy boundary.
B2t—15 to 29 inches; reddish brown (5YR 4/4) very cobbly sandy clay loam, reddish brown (5YR 4/3) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; 10 percent stones, 30 percent cobbles, and 25 percent gravel; neutral; gradual wavy boundary.
B3—29 to 38 inches; reddish brown (5YR 5/4) very cobbly sandy loam, reddish brown (5YR 4/4) moist; weak very fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; 5 percent stones, 40 percent cobbles, and 20 percent gravel; neutral; gradual wavy boundary.
C—38 to 60 inches; reddish brown (5YR 5/4) very cobbly loamy sand, reddish brown (5YR 4/4) moist; single grain; loose; 5 percent stones, 40 percent cobbles, and 20 percent gravel; neutral.

Depth to uniformly calcareous material ranges from 40 to 60 inches or more. The A horizon is dark reddish gray, reddish brown, or reddish gray. The B horizon is reddish brown or dark reddish gray. It is 35 to 70 percent rock fragments. The C horizon is very cobbly sandy loam or very cobbly loamy sand. It is 35 to 70 percent rock fragments.

Denver series

The Denver series consists of deep, well drained soils on uplands. These soils formed in residuum and colluvium derived from clayey shale. Slope is 4 to 25 percent. The average annual precipitation is 15 to 17 inches, and the average annual air temperature is 46 to 50 degrees F.

These soils are fine, montmorillonitic, mesic Torrertic Argiustolls.

Typical pedon of Denver clay loam, 4 to 25 percent slopes, 300 feet north and 500 feet east of the southwest corner of sec. 22, T. 29 S., R. 69 W.

A1—0 to 8 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; moderate very fine subangular blocky structure; hard, firm, sticky and plastic; neutral; abrupt smooth boundary.
B1—8 to 11 inches; grayish brown (2.5Y 5/2) clay, very dark grayish brown (2.5Y 3/2) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; thin patchy clay films on peds; neutral; clear smooth boundary.
B2t—11 to 23 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate coarse prismatic structure parting to moderate medium angular blocky; extremely hard, very firm, very sticky and very plastic; common thin clay films on peds; mildly alkaline; clear wavy boundary.
B3ca—23 to 38 inches; light brownish gray (2.5Y 6/2) clay, olive brown (2.5Y 4/4) moist; weak coarse subangular blocky structure; extremely hard, very firm, very sticky and very plastic; thin patchy clay films on peds; common medium segregated lime patches; calcareous; moderately alkaline; gradual wavy boundary.
Cca—38 to 60 inches; light yellowish brown (2.5Y 6/4) clay, light olive brown (2.5Y 5/4) moist; massive; extremely hard, very firm, very sticky and very plastic; common medium segregated lime patches; calcareous; moderately alkaline.

Depth to calcareous material ranges from 15 to 40 inches. Depth to shale is more than 60 inches, but it commonly is between depths of 60 and 72 inches. Cracks in the profile commonly extend to a depth of 23 inches. The A horizon is dark gray, grayish brown, or dark grayish brown. The B2t horizon is light brownish gray, light yellowish brown, grayish brown, light olive brown, or brown. It is mildly alkaline or moderately alkaline.

Farisita series

The Farisita series consists of shallow, well drained soils on ridges and side slopes. These soils formed in residuum and colluvium derived from sandstone and conglomerate. Slope is 10 to 35 percent. The average annual precipitation is 13 to 17 inches, and the average annual air temperature is about 46 to 52 degrees F.

These soils are loamy, mixed, nonacid, mesic, shallow Ustic Torriorthents.

Typical pedon of Farisita very gravelly sandy loam, 10 to 35 percent slopes, 950 feet west and 90 feet north of the southeast corner of sec. 30, T. 27 S., R. 67 W.

A1—0 to 4 inches; brown (10YR 4/3) very gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky; common fine roots; 10 percent cobbles and 30 percent pebbles; neutral; clear wavy boundary.
AC—4 to 12 inches; brownish yellow (10YR 6/6) coarse sandy loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky; few fine roots; 10 percent gravel; neutral; clear irregular boundary.
Cr—12 to 24 inches; soft weathered and fractured sandstone that has some soil material between fractures.
R—24 inches; hard sandstone.

Soft weathered bedrock is at a depth of less than 20 inches. The bedrock becomes hard between depths of 20 and 40 inches. The control section is 10 to 35 percent coarse fragments, mainly gravel and cobbles. Some pedons have small, discontinuous pockets of calcareous material. The profile is slightly acid to mildly alkaline. The A horizon is brown, pale brown, or grayish brown. The AC horizon is gravelly sandy loam or coarse sandy loam.

Fort Collins series

The Fort Collins series consists of deep, well drained soils on gently sloping and undulating uplands. These soils formed in eolian silt and fine sand. Slope is 1 to 9 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 50 to 54 degrees F.

These soils are fine-loamy, mixed, mesic Ustollic Haplargids.

Typical pedon of Fort Collins loam, 3 to 9 percent slopes, 2,100 feet north and 1,600 feet west of the southeast corner of sec. 22, T. 26 S., R. 66 W.

A1—0 to 4 inches; grayish brown (10YR 5/2) loam, dark brown (10YR 3/3) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.
B1—4 to 7 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common thin clay films on peds; mildly alkaline; clear smooth boundary.
B2t—7 to 19 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; strong medium prismatic structure parting to strong medium subangular blocky; very hard, friable, sticky and plastic; common thin clay films on peds; mildly alkaline; clear smooth boundary.
B3ca—19 to 23 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, slightly sticky and slightly plastic; thin streaks of secondary calcium carbonate; calcareous; mildly alkaline; gradual smooth boundary.
Cca—23 to 60 inches; light yellowish brown (10YR 6/4) loam, brown (10YR 5/3) moist; massive; very hard,

friable, slightly sticky and slightly plastic; thin streaks of secondary calcium carbonate; calcareous; moderately alkaline.

Depth to calcareous material ranges from 8 to 20 inches. The A1 horizon is grayish brown, light brownish gray, pale brown, or brown. The B2t horizon is light brownish gray, pale brown, light brown, brown, or yellowish brown. It is loam or clay loam and is 18 to 35 percent clay. It is neutral or mildly alkaline. The C horizon is pale brown, brown, light yellowish brown, or yellowish brown.

Fughes series

The Fughes series consists of deep, well drained soils on foot slopes and benches. These soils formed in colluvium derived shale and siltstone. Slope is 3 to 15 percent. The average annual precipitation is 18 to 22 inches, and the average annual air temperature is 40 to 44 degrees F.

These soils are fine, montmorillonitic Pachic Argiborolls.

Typical pedon of Fughes sandy clay loam, 3 to 15 percent slopes, 1,700 feet north and 1,900 feet east of the southwest corner of sec. 7, T. 30 S., R. 68 W.

A1—0 to 5 inches; dark brown (10YR 4/3) sandy clay loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure; slightly hard, friable, sticky and plastic; mildly alkaline; clear smooth boundary.

B1—5 to 9 inches; dark grayish brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure; very hard, firm, very sticky and plastic; mildly alkaline; clear smooth boundary.

B21t—9 to 20 inches; dark reddish gray (5YR 4/2) clay, dark reddish brown (5YR 3/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; very hard, firm, very sticky and plastic; common thin clay films on peds; mildly alkaline; clear wavy boundary.

B22t—20 to 38 inches; reddish brown (5YR 4/3) clay, dark reddish brown (5YR 3/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; thin nearly continuous clay films on peds; mildly alkaline; gradual wavy boundary.

B3—38 to 60 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; weak coarse prismatic structure; hard, firm, sticky and plastic; few thin clay films on peds; mildly alkaline.

Depth to calcareous material is 40 inches to more than 60 inches. The A1 horizon is brown or dark brown. The B2t horizon is reddish gray, dark reddish gray, or reddish brown. It is clay or heavy clay loam and is 35 to 50 percent clay.

Gelkie series

The Gelkie series consists of deep, well drained soils on uplands. These soils formed in colluvium derived from sandstone and siltstone. Slope is 3 to 30 percent. The average annual precipitation is 14 to 18 inches, and the average annual air temperature is 40 to 44 degrees F.

These soils are fine-loamy, mixed Argic Cryoborolls.

Typical pedon of Gelkie sandy loam, 3 to 15 percent slopes, 500 feet east and 650 feet north of the southwest corner of sec. 27, T. 24 S., R. 71 W.

A1—0 to 3 inches; brown (7.5YR 5/2) sandy loam, dark brown (7.5YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; 5 percent gravel; neutral; abrupt smooth boundary.

A3—3 to 5 inches; brown (7.5YR 5/2) sandy loam, dark brown (7.5YR 3/2) moist; weak very fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; 5 percent gravel; neutral; abrupt smooth boundary.

B2t—5 to 14 inches; dark brown (7.5YR 4/2) sandy clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, friable, slightly sticky and slightly plastic; 5 percent gravel; neutral; clear wavy boundary.

B3t—14 to 22 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 5 percent gravel; lime accumulations on bottom of gravel; neutral; abrupt wavy boundary.

C1ca—22 to 38 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; 10 percent gravel; calcareous; moderately alkaline; clear irregular boundary.

C2ca—38 to 42 inches; pink (7.5YR 7/4) gravelly sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 15 percent gravel; calcareous; moderately alkaline; clear irregular boundary.

C3ca—42 to 60 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 10 percent gravel; calcareous; moderately alkaline.

Depth to calcareous material ranges from 20 to 30 inches. The A horizon is brown, dark brown, grayish brown, or dark grayish brown. The B2t horizon is light brown, brown, pale brown, grayish brown, or yellowish brown. It is sandy clay loam or gravelly sandy clay loam. This horizon is 5 to 25 percent rock fragments. The C horizon is gravelly sandy loam or sandy loam. It averages 10 to 35 percent rock fragments.

Glenberg series

The Glenberg series consists of deep, well drained soils on flood plains. These soils formed in stratified sandy alluvium. Slope is 0 to 2 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 48 to 54 degrees F.

These soils are coarse-loamy, mixed (calcareous), mesic Ustic Torrifluvents.

Typical pedon of Glenberg sandy loam, 900 feet south and 1,300 feet east of the northwest corner of sec. 32, T. 27 S., R. 65 W.

A1—0 to 8 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; calcareous; moderately alkaline; abrupt smooth boundary.

C1—8 to 40 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; calcareous; moderately alkaline; gradual wavy boundary.

C2—40 to 60 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; few fine faint yellowish brown (10YR 5/8) mottles; massive; slightly hard, very friable, nonsticky and nonplastic; calcareous; moderately alkaline.

In some pedons the C horizon is noncalcareous. Some pedons have a thin stratum of loam to loamy sand. The control section is 8 to 18 percent clay. Content of rock fragments in the control section ranges from 0 to 15 percent but commonly is less than 5 percent. The A horizon is grayish brown, light brownish gray, light brown, or brown. The C horizon is light yellowish brown, grayish brown, light brownish gray, pale brown, or brown.

Goemmer series

The Goemmer series consists of moderately deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from clayey shale and siltstone. Slope is 20 to 50 percent. The average annual precipitation is 22 to 28 inches, and the average annual air temperature is 40 to 44 degrees F.

These soils are fine, mixed, frigid Typic Ustachrepts.

Typical pedon of Goemmer cobbly clay loam, 20 to 50 percent slopes, 1,250 feet north and 1,500 feet west of the southeast corner of sec. 23, T. 28 S., R. 69 W.

A1—0 to 4 inches; weak red (2.5YR 4/2) cobbly clay loam, dusky red (2.5YR 3/2) moist; moderate fine granular structure; slightly hard, firm, slightly sticky and nonplastic; 5 percent gravel and 25 percent cobbles; neutral; abrupt smooth boundary.

B2—4 to 21 inches; weak red (2.5YR 5/2) clay loam, weak red (2.5YR 4/2) moist; moderate medium prismatic structure parting to strong fine angular blocky; hard, firm, very sticky and plastic; 15 percent soft shale fragments; neutral; gradual wavy boundary.

B3—21 to 32 inches; weak red (2.5YR 4/2) clay loam, dark reddish brown (2.5YR 3/4) moist; moderate fine angular blocky structure; hard, firm, slightly sticky and slightly plastic; 40 percent soft shale fragments; neutral; clear wavy boundary.

Cr—32 to 60 inches; soft siltstone or shale.

Depth to soft bedrock ranges from 20 to 40 inches. The A1 horizon is weak red, reddish gray, dark reddish gray, or reddish brown. It is neutral or mildly alkaline. Some pedons have a thin A2 horizon. The B2 horizon is weak red, dark reddish gray, or reddish brown. It is 10 to 30 percent shale fragments and 35 to 50 percent clay. This horizon is slightly acid to mildly alkaline. The B3 horizon is weak red, reddish brown, or dark reddish gray. It is 20 to 45 percent shale fragments. This horizon is slightly acid to mildly alkaline.

Haverson series

The Haverson series consists of deep, well drained soils on flood plains and low terraces. These soils formed in stratified calcareous alluvium. Slope is 1 to 3 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 50 to 54 degrees F.

These soils are fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents.

Typical pedon of Haverson clay loam, 2,000 feet west and 2,300 feet south of the northeast corner of sec. 20, T. 26 S., R. 66 W.

A1—0 to 8 inches; light brownish gray (10YR 4/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; clear smooth boundary.

C1—8 to 28 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate very fine subangular blocky structure; hard, friable, sticky and plastic; few fine salt spots; calcareous; moderately alkaline; clear smooth boundary.

C2—28 to 38 inches; very pale brown (10YR 7/3) sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; calcareous; moderately alkaline; gradual smooth boundary.

C3—38 to 60 inches; grayish brown (10YR 5/2) loam, dark grayish brown (10YR 4/2) moist; few fine faint yellowish brown (10YR 5/8) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; common fine salt spots; calcareous; moderately alkaline.

The 10- to 40-inch control section is stratified sandy loam to clay loam, but the texture generally averages loam. The control section is 18 to 35 percent clay. It generally is less than 5 percent rock fragments, but the content ranges from 0 to 15 percent. The profile commonly is slightly saline, but it is nonsaline in some pedons. The A horizon is light brownish gray, grayish brown, pale brown, or brown. It is mildly alkaline or moderately alkaline. The C horizon is grayish brown, light brownish gray, pale brown, or very pale brown.

Holderness series

The Holderness series consists of deep, well drained soils on foot slopes and benches. These soils formed in colluvium derived from shale and siltstone. Slope is 4 to 20 percent. The average annual precipitation is 16 to 18 inches, and the average annual air temperature is 40 to 44 degrees F.

These soils are fine, montmorillonitic Aridic Argiborolls.

Typical pedon of Holderness loam, 4 to 20 percent slopes, 1,500 feet south and 950 feet east of the northwest corner of sec. 13, T. 30 S., R. 69 W.

O1—2 inches to 0; partially decomposed oak leaves.
A11—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; neutral; abrupt smooth boundary.
A12—4 to 8 inches; dark grayish brown (10YR 4/2) heavy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; mildly alkaline; clear wavy boundary.
B1—8 to 10 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; mildly alkaline; clear smooth boundary.
B21t—10 to 15 inches; brown (10YR 5/2) clay, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; mildly alkaline; clear smooth boundary.
B22t—15 to 51 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 4/2) moist; strong medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; mildly alkaline; abrupt wavy boundary.
Cr—51 inches; weathered siltstone.

Bedrock is at a depth of 40 to 60 inches. Calcareous material is at a depth of 40 to 60 inches. A C horizon is present in some pedons. The A1 horizon is dark grayish brown, grayish brown, or brown. It is slightly acid to mildly alkaline. The B2t horizon is brown, light brown, yellowish brown, or grayish brown. It is clay or heavy clay loam that is 35 to 50 percent clay. The horizon is neutral or mildly alkaline.

Kim series

The Kim series consists of deep, well drained soils on terraces and uplands. These soils formed in alluvial and eolian material and fine sand derived from sandstone. Slope is 1 to 9 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 48 to 54 degrees F.

These soils are fine-loamy, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of a Kim loam in an area of Wiley-Kim loams, 2 to 9 percent slopes, 1,100 feet south and 1,000 feet east of the northwest corner of sec. 7, T. 28 S., R. 64 W.

A1—0 to 8 inches; light brownish gray (10YR 6/2) loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; calcareous; mildly alkaline; clear smooth boundary.
C1—8 to 20 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; gradual smooth boundary.
C2—20 to 60 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few filaments and soft masses of secondary calcium carbonate; calcareous; moderately alkaline.

Content of coarse fragments in the profile ranges from 0 to 15 percent but commonly is less than 10 percent. The A horizon is light brownish gray, brown, or light yellowish brown. It is loam or fine sandy loam and is mildly alkaline or moderately alkaline. The C horizon is pale brown, brown, yellowish brown, light brownish gray, or light grayish brown.

Lakehelen series

The Lakehelen series consists of moderately deep, well drained soils on mountains. These soils formed in residuum and colluvium derived from sandstone. Slope is 5 to 40 percent. The average annual precipitation is 20 to 25 inches, and the average annual air temperature is 38 to 42 degrees F.

These soils are loamy-skeletal, mixed Typic Cryoboralfs.

Typical pedon of a Lakehelen fine sandy loam in an area of Uinta-Lakehelen fine sandy loams, 4 to 25 percent slopes, 350 feet north and 800 feet west of the southeast corner of sec. 22, T. 28 S., R. 70 W.

O1—1 inch to 0; partially decomposed needles and twigs.
A21—0 to 4 inches; pinkish gray (5YR 6/2) fine sandy loam, reddish brown (5YR 4/3) moist; weak fine

granular structure; soft, very friable, nonsticky and nonplastic; 10 percent gravel; slightly acid; clear smooth boundary.

A22—4 to 12 inches; light reddish brown (5YR 6/3) fine sandy loam, reddish brown (5YR 5/3) moist; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; 15 percent gravel; medium acid; clear wavy boundary.

A&B—12 to 16 inches; mixed light reddish brown (5YR 6/3) and reddish brown (5YR 5/3) very cobbly sandy loam, mixed reddish brown (5YR 5/4) and dark reddish brown (5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and nonplastic; few thin clay films on peds; 15 percent gravel, 20 percent cobbles, and 10 percent stones; slightly acid; clear irregular boundary.

B2t—16 to 28 inches; reddish brown (5YR 5/3) extremely cobbly sandy clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common thin clay films on peds; 20 percent gravel, 20 percent cobbles, and 30 percent stones; slightly acid; clear irregular boundary.

R—28 inches; fractured sandstone.

Bedrock is at a depth of 20 to 40 inches. The profile is slightly acid or medium acid. The A horizon is pinkish gray or light reddish brown. The B horizon is reddish brown or dark reddish brown. It is 35 to 70 percent rock fragments.

Larkson series

The Larkson series consists of deep, well drained soils on fans and foot slopes. These soils formed in colluvium derived from shale. Slope is 5 to 20 percent. The average annual precipitation is 21 to 25 inches, and the average annual air temperature is 42 to 44 degrees F.

These soils are fine, montmorillonitic Typic Eutroboralfs.

Typical pedon of Larkson stony loam, 5 to 20 percent slopes, 2,100 feet east and 300 feet south of the northwest corner of sec. 13, T. 25 S., R. 68 W.

O1—2 inches to 0; needles, twigs, and cones from ponderosa pine.

A1—0 to 3 inches; grayish brown (10YR 5/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; 2 percent stones; slightly acid; abrupt smooth boundary.

A2—3 to 8 inches; pale brown (10YR 6/3) stony loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

A&B—8 to 12 inches; mixed pale brown (10YR 6/3) and brown (7.5YR 5/4) clay loam (composite texture), dark brown (10YR 4/3) moist; moderate fine angular blocky structure; very hard, very friable, sticky and slightly plastic; neutral; gradual wavy boundary.

B2t—12 to 36 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; extremely hard, firm, sticky and plastic; neutral; gradual wavy boundary.

B3—36 to 44 inches; light brown (7.5YR 6/4) clay, brown (7.5YR 5/4) moist; moderate coarse angular blocky structure; extremely hard, firm, sticky and plastic; neutral; gradual wavy boundary.

C—44 to 60 inches; pale brown (10YR 6/3) clay loam, dark brown (10YR 4/3) moist; massive; extremely hard, firm, sticky and plastic; neutral.

Lime is at a depth of more than 40 inches. The A1 and A2 horizons are slightly acid or neutral; below this the profile is neutral or mildly alkaline. The A1 horizon is dark brown, dark grayish brown, or grayish brown. The A2 horizon is light brownish gray or pale brown. The B2t horizon is brown, dark yellowish brown, or yellowish brown. It is heavy clay loam or light clay. The C horizon is pale brown, brown, or light gray. It is heavy clay loam or light clay. High chroma mottles are in the B3 and C horizons in some pedons.

Las Animas series

The Las Animas series consists of deep, poorly drained soils on low stream terraces. These soils formed in alluvium. Slope is 0 to 2 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 48 to 54 degrees F.

These soils are coarse-loamy, mixed (calcareous), mesic Typic Fluvaquents.

Typical pedon of a Las Animas sandy loam in an area of Riverwash-Las Animas complex, 1,200 feet south and 250 feet east of the northwest corner of sec. 34, T. 26 S., R. 67 W.

A1—0 to 6 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; common medium distinct yellowish brown (10YR 5/4) and very dark gray (10YR 3/1) mottles; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and slightly plastic; common fine salt spots; moderately saline; calcareous; moderately alkaline; clear wavy boundary.

AC—6 to 23 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; common large prominent brownish yellow (10YR 6/8) mottles, and common medium faint dark gray (10YR 4/1) mottles; weak coarse subangular blocky structure; soft, very friable, nonsticky and nonplastic; calcareous; moderately alkaline; clear irregular boundary.

C1—23 to 33 inches; pinkish gray (7.5YR 7/2) loamy sand, brown (7.5YR 5/3) moist; common large prominent strong brown (7.5YR 5/8) mottles; single

grain; loose; calcareous; moderately alkaline; clear irregular boundary.
C2—33 to 60 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; common large prominent dark gray (N 4/0) mottles; massive; soft, very friable, nonsticky and nonplastic; 15 percent gravel; calcareous; moderately alkaline.

The 10- to 40-inch control section is 0 to 15 percent rock fragments. The A horizon is brown or grayish brown. The C horizon is light gray, pinkish gray, or brown.

Leadville series

The Leadville series consists of deep, well drained soils on mountainsides. These soils formed in residuum and colluvium. Slope is 25 to 55 percent. The average annual precipitation is 20 to 30 inches, and the average annual air temperature is 38 to 45 degrees F.

These soils are loamy-skeletal, mixed Typic Cryoboralfs.

Typical pedon of Leadville fine sandy loam, 25 to 55 percent slopes, 1,000 feet west and 2,000 feet south of the northeast corner of sec. 26, T. 28 S., R. 70 W.

O1—2 inches to 0; partially decomposed needles and twigs.
A2—0 to 10 inches; light reddish brown (5YR 6/3) fine sandy loam, reddish brown (5YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; 5 percent gravel and 2 percent cobbles; medium acid; clear wavy boundary.
B&A—10 to 22 inches; mixed reddish brown (5YR 4/3) and light reddish brown (5YR 6/3) very stony loam (composite texture), reddish brown (5YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, very friable, slightly sticky and slightly plastic; common thin clay films on peds; 20 percent gravel, 5 percent cobbles, and 10 percent stones; medium acid; gradual wavy boundary.
B2t—22 to 39 inches; reddish brown (5YR 5/3) extremely stony clay loam, reddish brown (2.5YR 4/4) moist; moderate fine angular blocky structure; very hard, firm, sticky and plastic; many thin clay films on peds; 20 percent gravel, 10 percent cobbles, and 40 percent stones; neutral; clear irregular boundary.
B3—39 to 44 inches; reddish brown (5YR 5/3) extremely stony sandy loam, reddish brown (2.5YR 4/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common thin clay films on peds; 15 percent gravel, 10 percent cobbles, and 50 percent stones; neutral; clear irregular boundary.
C—44 to 60 inches; reddish brown (5YR 5/3) extremely stony sandy loam, reddish brown (5YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 5 percent gravel, 15 percent cobbles, and 60 percent stones; neutral.

Most of the solum and the C horizon are 35 to 80 percent rock fragments. The A2 horizon is light reddish brown or reddish brown. It is medium acid to neutral. The B2t horizon is reddish brown or light reddish brown. It is slightly acid or neutral. The fine earth fraction of the horizon is clay loam or sandy clay loam. The C horizon is reddish brown or dark reddish gray. It is slightly acid or neutral.

Libeg series

The Libeg series consists of deep, well drained soils on fans and terraces. These soils formed in alluvium and colluvium. Slope is 5 to 45 percent. The average annual precipitation is 18 to 23 inches, and the average annual air temperature is 42 to 45 degrees F.

These soils are loamy-skeletal, mixed Argic Cryoborolls.

Typical pedon of a Libeg gravelly sandy loam in an area of Libeg-Coutis complex, 5 to 15 percent slopes, in an unsectionalized area about 2 miles west and 3.5 miles south of the Chama Church, T. 27 S., R. 71 W.

A1—0 to 10 inches; dark gray (10YR 4/1) gravelly sandy loam, very dark brown (10YR 2/2) moist; moderate medium and coarse granular structure; slightly hard, friable, nonsticky and nonplastic; 30 percent gravel; neutral; clear smooth boundary.
A3—10 to 14 inches; dark gray (10YR 4/1) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; 25 percent gravel; neutral; clear wavy boundary.
B21t—14 to 28 inches; brown (7.5YR 5/4) very gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; extremely hard, firm, slightly sticky and slightly plastic; many thin clay films on peds; 50 percent gravel; neutral; gradual wavy boundary.
B22t—28 to 37 inches; strong brown (7.5YR 5/6) very gravelly sandy clay loam, strong brown (7.5YR 4/6) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; extremely hard, firm, slightly sticky and slightly plastic; common thin clay films on peds; 50 percent gravel; mildly alkaline; gradual wavy boundary.
B3—37 to 60 inches; strong brown (7.5YR 5/6) very gravelly sandy clay loam, strong brown (7.5YR 5/6) moist; weak medium subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few thin clay films on peds; 60 percent gravel; mildly alkaline.

The mollic epipedon is 10 to 14 inches thick. The A horizon is dark gray, dark grayish brown, or grayish brown. The B2t horizon is brown, dark brown, or strong brown. It is 35 to 60 percent coarse fragments. The B3 horizon is brown or strong brown.

Limon series

The Limon series consists of deep, well drained soils on flood plains and alluvial fans. These soils formed in alluvial sediment derived mainly from clay shale. Slope is 0 to 12 percent. The average annual precipitation is 13 to 15 inches, and the average annual air temperature is 47 to 54 degrees F.

These soils are fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents.

Typical pedon of Limon silty clay loam, 0 to 2 percent slopes, 2,600 feet south and 800 feet west of the northeast corner of sec. 16, T. 29 S., R. 65 W.

A1—0 to 2 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, friable, sticky and plastic; calcareous; moderately alkaline; abrupt smooth boundary.

AC—2 to 12 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; very hard, very firm, sticky and plastic; few fine gypsum crystals; calcareous; strongly alkaline; clear smooth boundary.

C1cs—12 to 24 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak medium subangular blocky structure; very hard, very firm, sticky and plastic; common fine gypsum crystals; calcareous; moderately alkaline; clear smooth boundary.

C2—24 to 60 inches; light brownish gray (2.5Y 6/2) silty clay, dark grayish brown (2.5Y 4/2) moist; weak very fine subangular blocky structure; very hard, very firm, sticky and plastic; few fine gypsum crystals; calcareous; moderately alkaline.

Content of rock fragments in the profile ranges from 0 to 5 percent but typically is less than 2 percent. The profile commonly is slightly saline, but it is nonsaline in some pedons. The A horizon is light brownish gray, grayish brown, light olive gray, or pale brown. The C horizon is light brownish gray, grayish brown, or pale olive. It is moderately alkaline or strongly alkaline.

Loberg series

The Loberg series consists of deep, well drained soils on foot slopes of mountains. These soils formed in mixed colluvium. Slope is 4 to 25 percent. The average annual precipitation is 23 to 30 inches, and the average annual air temperature is 38 to 45 degrees F.

These soils are clayey-skeletal, mixed Typic Cryoboralfs.

Typical pedon of Loberg cobbly loam, 4 to 25 percent slopes, 1,140 feet south and 140 feet west of the northeast corner of sec. 28, T. 30 S., R. 68 W.

O1—1 inch to 0; forest litter and humus.

A1—0 to 3 inches; brown (7.5YR 5/2) cobbly loam, dark brown (7.5YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 1 percent stones and 15 percent cobbles; strongly acid; gradual smooth boundary.

A2—3 to 19 inches; light reddish brown (5YR 6/3) cobbly loam, reddish brown (5YR 4/3) moist; weak fine subangular blocky structure parting to weak very fine granular; slightly hard, very friable, slightly sticky and slightly plastic; 1 percent stones and 25 percent cobbles; medium acid; clear wavy boundary.

B21t—19 to 40 inches; reddish brown (5YR 5/3) very cobbly clay, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky and plastic; 35 percent cobbles; neutral; clear smooth boundary.

B22t—40 to 52 inches; light brown (7.5YR 6/4) very cobbly clay, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; very hard, very firm, very sticky and plastic; 40 percent cobbles and 10 percent gravel; neutral; gradual wavy boundary.

B3—52 to 60 inches; light brown (7.5YR 6/4) very cobbly clay loam, brown (7.5YR 5/4) moist; weak fine subangular blocky structure; hard, firm, sticky and plastic; 40 percent cobbles and 15 percent gravel; neutral.

The A2 horizon is pale brown, pinkish gray, or light reddish brown. The B2t horizon is reddish brown, brown, or light brown. It is very cobbly clay loam or very cobbly clay and averages 35 to 50 percent clay. This horizon is 35 to 60 percent rock fragments.

Louviers series

The Louviers series consists of shallow, well drained soils on side slopes of dissected plateaus. These soils formed in material derived from noncalcareous clayey shale. Slope is 10 to 65 percent. The average annual precipitation is 14 to 16 inches, and the average annual air temperature is 48 to 54 degrees F.

These soils are clayey, mixed, nonacid, mesic, shallow Ustic Torriorthents.

Typical pedon of a Louviers very channery clay loam in an area of Louviers-Travessilla complex, 3 to 25 percent slopes, 300 feet north and 1,200 feet west of the southeast corner of sec. 35, T. 27 S., R. 67 W.

A1—0 to 3 inches; brown (10YR 5/3) very channery clay loam, dark brown (10YR 4/3) moist; moderate very fine granular structure; slightly hard, friable, slightly

sticky and slightly plastic; 40 percent sandstone fragments; neutral; clear smooth boundary.
AC—3 to 10 inches; light olive brown (2.5Y 5/4) clay loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure; very hard, friable, sticky and plastic; 15 percent soft shale fragments; neutral; clear smooth boundary.
C1—10 to 16 inches; light olive brown (2.5Y 5/4) clay loam, light olive brown (2.5Y 5/4) moist; massive; very hard, friable, sticky and plastic; 25 percent soft shale fragments; neutral; clear smooth boundary.
C2r—16 inches; light olive brown (2.5Y 5/4) noncalcareous shale.

Bedrock is at a depth of 10 to 20 inches. The control section is 35 to 50 percent clay. It commonly is less than 5 percent soft shale fragments, but the content ranges from 0 to 25 percent. The A horizon is brown or grayish brown. It is neutral or mildly alkaline. The C horizon is light olive brown, olive brown, or dark brown. It is clay loam, clay, or shaly clay loam. This horizon is neutral or mildly alkaline.

Lymanson series

The Lymanson series consists of moderately deep, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from conglomerate and sandstone. Slope is 20 to 40 percent. The average annual precipitation is 14 to 18 inches, and the average annual air temperature is 40 to 44 degrees F.

These soils are fine-loamy, mixed Argic Cryoborolls.

Typical pedon of Lymanson cobbly fine sandy loam, 20 to 40 percent slopes, about 700 feet north and 1,200 feet west of the southeast corner of sec. 1, T. 25 S., R. 71 W.

A1—0 to 3 inches; grayish brown (10YR 5/2) cobbly fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; 15 percent cobbles and 15 percent gravel; neutral; clear smooth boundary.
B2t—3 to 12 inches; brown (10YR 5/3) gravelly sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 20 percent gravel; neutral; abrupt wavy boundary.
B3tca—12 to 19 inches; light brownish gray (2.5Y 4/2) gravelly sandy clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine subangular blocky structure; very hard, very friable, sticky and slightly plastic; 20 percent gravel; calcareous; moderately alkaline; gradual wavy boundary.
C1ca—19 to 29 inches; light brownish gray (2.5Y 6/2) gravelly sandy clay loam, grayish brown (2.5Y 5/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; 20 percent gravel; calcareous; moderately alkaline; abrupt wavy boundary.
C2r—29 to 60 inches; soft conglomeritic tuff.

Soft bedrock is at a depth of 20 to 40 inches. The control section is 15 to 35 percent rock fragments. Calcareous material is at a depth of 10 to 20 inches. The A horizon is grayish brown, dark brown, or dark grayish brown. The B2t horizon is brown or grayish brown. It is neutral or mildly alkaline. The C horizon is light brownish gray or grayish brown. It is 15 to 35 percent rock fragments.

Maitland series

The Maitland series consists of deep, well drained soils on mountainsides and foot slopes. These soils formed in colluvium derived from sandstone and shale. Slope is 1 to 35 percent. The average annual precipitation is 18 to 23 inches, and the average annual air temperature is 40 to 44 degrees F.

These soils are fine-loamy, mixed Mollic Eutroboralfs.

Typical pedon of Maitland fine sandy loam, 1 to 15 percent slopes, 900 feet south and 200 feet west of the northeast corner of sec. 11, T. 30 S., R. 68 W.

O1—1 inch to 0; partially decomposed twigs and needles.
A1—0 to 5 inches; grayish brown (10YR 5/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; slightly acid; clear wavy boundary.
A2—5 to 10 inches; pinkish gray (7.5YR 6/2) fine sandy loam, dark brown (7.5YR 4/2) moist; weak coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; slightly acid; clear wavy boundary.
A&B—10 to 14 inches; mixed brown (7.5YR 5/2) and brown (7.5YR 5/4) sandy clay loam (composite texture), dark brown (7.5YR 4/2) and dark brown (7.5YR 4/4) moist; moderate medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; slightly acid; clear wavy boundary.
B2t—14 to 33 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate fine angular blocky; very hard, firm, sticky and plastic; continuous thin clay films on peds; slightly acid; gradual wavy boundary.
B3—33 to 45 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to weak medium angular blocky; very hard, firm, sticky and plastic; many thin clay films on peds; slightly acid; gradual wavy boundary.
C—45 to 60 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; slightly acid.

The A1 horizon is grayish brown, dark grayish brown, brown, or dark brown. The A2 horizon is pinkish gray, pale brown, or light brown. The B horizon is brown or dark brown. It is 20 to 35 percent clay.

Manvel series

The Manvel series consists of deep, well drained soils on foot slopes. These soils formed in residuum and colluvium. Slope is 1 to 5 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 48 to 55 degrees F.

These soils are fine-silty, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of Manvel silty clay loam, 1 to 5 percent slopes, 2,400 feet east and 700 feet north of the southwest corner of sec. 12, T. 25 S., R. 67 W.

A1—0 to 5 inches; pale brown (10YR 6/3) silty clay loam, dark brown (10YR 4/3) moist; moderate very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; clear smooth boundary.

AC—5 to 16 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; clear smooth boundary.

C1—16 to 22 inches; pale brown (10YR 6/3) silty clay loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine soft lime masses; calcareous; moderately alkaline; gradual smooth boundary.

C2—22 to 40 inches; very pale brown (10YR 7/3) silt loam, light yellowish brown (10YR 6/4) moist; weak thick platy structure; hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; gradual wavy boundary.

C3—40 to 60 inches; very pale brown (10YR 7/3) silt loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline.

The A horizon is pale brown, brown, grayish brown, or light brownish gray. It is loam or silty clay loam. The C horizon is very pale brown, pale brown, or light yellowish brown. It is silt loam or silty clay loam. The calcium carbonate equivalent is 15 to 40 percent.

Manzano series

The Manzano series consists of deep, well drained soils on terraces and flood plains. These soils formed in alluvium. Slope is 0 to 3 percent. The average annual precipitation is 15 to 18 inches, and the average annual air temperature is 45 to 50 degrees F.

These soils are fine-loamy, mixed, mesic Cumulic Haplustolls.

Typical pedon of Manzano loam, 175 feet north and 1,360 feet west of the southeast corner of sec. 18, T. 28 S., R. 66 W.

A11—0 to 3 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

A12—3 to 8 inches; dark grayish brown (10YR 4/2) loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; mildly alkaline; clear wavy boundary.

B2—8 to 15 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; mildly alkaline; gradual smooth boundary.

B3ca—15 to 25 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; thin seams and streaks of secondary calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

C1ca—25 to 37 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine salt crystals; calcareous; moderately alkaline; abrupt smooth boundary.

C2ca—37 to 60 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; few faint yellowish red (5YR 5/6) mottles; massive; slightly hard, very friable, slightly sticky and slightly plastic; calcareous; moderately alkaline.

The mollic epipedon is more than 20 inches thick. The 10- to 40-inch control section is 18 to 30 percent clay. The A horizon is brown, grayish brown, or dark grayish brown and is neutral or mildly alkaline. The B and C horizons are 0 to 15 percent gravel.

Manzanola series

The Manzanola series consists of deep, well drained soils on terraces, fans, and uplands. These soils formed in calcareous, fine-textured residuum and alluvium derived from shale. Slope is 0 to 5 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 49 to 54 degrees F.

These soils are fine, montmorillonitic, mesic Ustollic Haplargids.

Typical pedon of Manzanola clay loam, 0 to 2 percent slopes, 2,100 feet north and 1,200 feet west of the southeast corner of sec. 16, T. 29 S., R. 65 W.

A1—0 to 4 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; moderate very fine granular structure; slightly hard, very friable, sticky and plastic; calcareous; mildly alkaline; clear smooth boundary.

B1—4 to 7 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; slightly hard, very friable, sticky and plastic; few thin clay films; calcareous; mildly alkaline; clear smooth boundary.

B21t—7 to 12 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate fine and medium angular blocky structure; very hard, firm, sticky and plastic; thin continuous clay films; calcareous; moderately alkaline; gradual smooth boundary.

B22t—12 to 20 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; continuous clay films; calcareous; moderately alkaline; clear smooth boundary.

B3ca—20 to 30 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; very hard, firm, sticky and plastic; few thin clay films; calcareous; soft masses, seams, and streaks of lime; moderately alkaline; gradual smooth boundary.

Cca—30 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; massive; very hard, firm, sticky and plastic; soft masses, seams, and streaks of lime; calcareous; moderately alkaline.

Depth to uniformly calcareous material ranges from 0 to 8 inches. Depth to continuous layers of visible secondary carbonate or sulfate, or both, is 10 to 40 inches. Most of the solum and the part of the C horizon above a depth of 40 inches are 0 to 10 percent rock fragments. The A horizon is light brownish gray or grayish brown. It is mildly alkaline or moderately alkaline. The B2t horizon is grayish brown, brown, or yellowish brown. It is mildly alkaline or moderately alkaline. The B2t horizon is clay loam, silty clay loam, or clay. The C horizon is nonsaline or slightly saline.

Midway series

The Midway series consists of shallow, well drained soils on ridges and side slopes. These soils formed in residuum and colluvium derived from shale. Slope is 3 to 25 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 50 to 54 degrees F.

These soils are clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents.

Typical pedon of Midway clay, 3 to 20 percent slopes, 1,200 feet north and 500 feet east of the southwest corner of sec. 11, T. 28 S., R. 66 W.

A1—0 to 4 inches; light brownish gray (2.5Y 6/2) clay, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure parting to weak fine granular; very hard, very firm, very sticky and very plastic; calcareous; moderately alkaline; clear wavy boundary.

AC—4 to 10 inches; light brownish gray (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak thin platy structure parting to weak fine subangular blocky; hard, firm, very sticky and very plastic; 25 percent soft shale fragments; many fine gypsum crystals; calcareous; moderately alkaline; clear wavy boundary.

C1—10 to 14 inches; light yellowish brown (2.5Y 6/4) clay, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; 30 percent soft shale fragments; many fine gypsum crystals; calcareous; moderately alkaline; clear wavy boundary.

C2r—14 to 60 inches; calcareous platy shale.

Bedrock is at a depth of 10 to 20 inches. The profile is moderately alkaline or strongly alkaline. It is 35 to 45 percent clay and is less than 10 percent sand that is fine or coarser. The A1 horizon is light brownish gray, grayish brown, or light yellowish brown. The C horizon is clay or silty clay loam. It is 20 to 30 percent shale fragments.

Minnequa series

The Minnequa series consists of moderately deep, well drained soils on uplands. These soils formed in residuum and locally transported sediment derived from interbedded limestone and calcareous shale. Slope is 1 to 15 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 49 to 54 degrees F.

These soils are fine-silty, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of a Minnequa loam in an area of Manvel-Minnequa loams, 1 to 5 percent slopes, 660 feet south and 330 feet east of the northwest corner of sec. 8, T. 27 S., R. 63 W.

A1—0 to 6 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; clear smooth boundary.

AC—6 to 21 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; gradual smooth boundary.

C1—21 to 33 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; few thin seams and streaks of lime; calcareous; moderately alkaline; abrupt smooth boundary.

C2r—33 to 60 inches; chalky limestone.

Depth to bedrock ranges from 20 to 40 inches. Depth to uniformly calcareous material ranges from 0 to 3 inches. The A1 horizon is light brownish gray, grayish brown, pale brown, or brown.

Montez series

The Montez series consists of deep, well drained soils on mountainsides. These soils formed in colluvium derived from granite. Slope is 20 to 50 percent. The average annual precipitation is 20 to 25 inches, and the average annual air temperature is 38 to 43 degrees F.

These soils are fine-loamy, mixed Mollic Paleboralfs.

Typical pedon of a Montez sandy loam in an area of Montez-Rogert complex, 15 to 65 percent slopes, 2,530 feet west and 300 feet north of the southeast corner of sec. 33, T. 26 S., R. 72 W.

O1—2 inches to 0; undecomposed and partially decomposed pine needles, twigs, and grass remains.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) sandy loam, very dark brown (10YR 2/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; neutral; clear wavy boundary.

A2—7 to 22 inches; light brownish gray (10YR 6/2) loamy sand, dark brown (10YR 4/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; neutral; clear wavy boundary.

A&B—22 to 28 inches; mixed light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) heavy sandy loam, dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) moist; 60 percent of the material is similar to that of the overlying horizon; the B material is in pockets surrounded by A material in the upper part of the horizon, and the A material is in pockets surrounded by B material in the lower part; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; clear wavy boundary.

B2t—28 to 36 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; 20 percent gravel; neutral; gradual wavy boundary.

B3t—36 to 41 inches; brownish yellow (10YR 6/6) gravelly sandy clay loam, yellowish brown (10YR 5/6) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; 30 percent gravel; slightly acid; gradual wavy boundary.

C—41 to 50 inches; brownish yellow (10YR 6/6) very gravelly loamy sand, yellowish brown (10YR 5/8) moist; massive; hard, friable, nonsticky; 50 percent gravel; mildly alkaline; abrupt wavy boundary.

R—50 inches; granite.

Depth to bedrock is 40 to 60 inches. The top of the argillic horizon is at a depth of more than 24 inches. Content of rock fragments in the lower part of the profile increases with depth. The A1 horizon is dark brown, brown, very dark grayish brown, or dark grayish brown. The B2t horizon is strong brown, yellowish brown, or brownish yellow. It averages 20 to 35 percent clay and 40 to 75 percent sand. It is 15 to 35 percent rock fragments. The C horizon, where present, is very gravelly loamy sand or gravelly loamy sand.

Morop series

The Morop series consists of deep, well drained soils on high terraces. These soils formed in alluvium. Slope is 2 to 18 percent. The average annual precipitation is 16 to 18 inches, and the average annual air temperature is 40 to 44 degrees F.

These soils are fine, montmorillonitic Aridic Argiborolls.

Typical pedon of Morop loam, 2 to 18 percent slopes, 700 feet south and 800 feet west of the northeast corner of sec. 1, T. 30 S., R. 68 W.

A1—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B1—7 to 10 inches; dark brown (7.5YR 4/2) clay loam, very dark brown (7.5YR 3/2) moist; moderate fine subangular blocky structure; very hard, friable, sticky and plastic; common thin patchy clay films on peds; neutral; clear smooth boundary.

B21t—10 to 15 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate fine subangular blocky; extremely hard, firm, very sticky and very plastic; many thin clay films on peds; neutral; gradual smooth boundary.

B22t—15 to 30 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; very hard, friable, sticky and plastic; many thin clay films on peds; neutral; gradual wavy boundary.

B23t—30 to 40 inches; brown (7.5YR 5/4) very stony clay, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; many thin clay films on peds; 25 percent stones and 25 percent cobbles; mildly alkaline; clear irregular boundary.

Cca—40 to 60 inches; pinkish white (7.5YR 8/2) very stony clay loam, pinkish gray (7.5YR 7/2) moist; massive; hard, friable, sticky and plastic; 25 percent stones, 25 percent cobbles, and 15 percent gravel; calcareous; moderately alkaline.

The base of the argillic horizon ranges from 25 to 50 inches. Depth to continuous layers of visible secondary calcium carbonate ranges from 20 to 50 inches. Content

of rock fragments, mainly 10 inches or more in diameter, increases with depth; it averages 0 to 15 percent in most of the solum and in the part of the C horizon above a depth of 50 inches.

The A horizon is brown, dark brown, grayish brown, or dark grayish brown.

The B2t horizon is brown or dark brown. It is heavy clay loam or clay in the upper part and is very stony clay in the lower part. The B2t horizon is neutral or mildly alkaline. It is 0 to 10 percent rock fragments in the upper part and 25 to 60 percent rock fragments in the lower part.

The C horizon is 35 to 70 percent rock fragments.

Mortenson series

The Mortenson series consists of deep, well drained soils on mountainsides. These soils formed in colluvium and residuum derived from granite. Slope is 35 to 50 percent. The average annual precipitation is 23 to 25 inches, and the average annual air temperature is 42 to 44 degrees F.

These soils are clayey-skeletal, montmorillonitic Typic Paleboralfs.

Typical pedon of a Mortenson very stony loam in an area of Wetmore-Mortenson Association, 20 to 50 percent slopes, 350 feet south and 200 feet east of the northwest corner of sec. 13, T. 25 S., R. 68 W.

O1—1 inch to 0; partially decomposed Douglas-fir and white fir needles.

A21—0 to 6 inches; pale brown (10YR 6/3) very stony loam, brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; 15 percent gravel, 10 percent cobbles, and 15 percent stones; neutral; clear wavy boundary.

A22—6 to 22 inches; very pale brown (10YR 7/3) very stony sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; 15 percent gravel, 10 percent cobbles, and 15 percent stones; slightly acid; gradual irregular boundary.

A&B—22 to 29 inches; very pale brown (10YR 7/3) and brown (7.5YR 5/4) very stony sandy clay loam (composite texture), brown (10YR 5/3) and dark brown (7.5YR 4/4) moist; moderate fine subangular blocky structure; very hard, firm, sticky and plastic; 15 percent gravel, 10 percent cobbles, and 15 percent stones; slightly acid; gradual wavy boundary.

B2t—29 to 60 inches; brown (7.5YR 5/4) very cobbly clay, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; very hard, firm, very sticky and plastic; 25 percent gravel, 20 percent cobbles, and 5 percent stones; neutral.

The profile is slightly acid or neutral. An A1 horizon is present in some pedons. It is gray, dark gray, grayish brown, or dark grayish brown. The A2 horizon is very pale brown, pale brown, light brownish gray, pinkish gray, or light gray. It is very stony sandy loam or very cobbly sandy loam. The B2t horizon has hue of 10YR or 7.5YR and is pale brown, light brown, or light yellowish brown. It is very stony clay or very cobbly clay and is 35 to 60 percent rock fragments.

Neville series

The Neville series consists of deep, well drained soils on uplands, in drainageways, and on foot slopes. These soils formed in mixed alluvium and colluvium derived from sandstone, siltstone, and shale. Slope is 1 to 9 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 48 to 52 degrees F.

These soils are fine-loamy, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of Neville fine sandy loam, 3 to 9 percent slopes, 1,100 feet east and 300 feet north of the southwest corner of sec. 14, T. 26 S., R. 70 W.

A1—0 to 5 inches; reddish brown (5YR 5/3) fine sandy loam, reddish brown (5YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and slightly plastic; calcareous; moderately alkaline; clear smooth boundary.

AC—5 to 24 inches; reddish brown (5YR 5/3) loam, reddish brown (5YR 4/3) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and plastic; calcareous; moderately alkaline; gradual smooth boundary.

C—24 to 60 inches; reddish brown (5YR 5/3) loam, reddish brown (10YR 4/3) moist; massive; hard, very friable, slightly sticky and plastic; calcareous; moderately alkaline.

Some visible secondary carbonate is in some pedons, but there is no distinct continuous horizon of secondary carbonate accumulation above a depth of 40 inches. In most pedons the profile is calcareous throughout, but in some pedons carbonates are leached from the upper few inches. The profile is 0 to 15 percent coarse fragments. The A horizon is reddish brown or light reddish brown. It is mildly alkaline or moderately alkaline.

Noden series

The Noden series consists of deep, well drained soils on foot slopes. These soils formed in mixed sediment. Slope is 1 to 15 percent. The average annual precipitation is 15 to 18 inches, and the average annual air temperature is 47 to 52 degrees F.

These soils are fine-loamy, mixed, mesic Aridic Argiustolls.

Typical pedon of Noden loam, 1 to 9 percent slopes, 1,400 feet west and 1,900 feet north of the southeast corner of sec. 9, T. 30 S., R. 66 W.

A1—0 to 7 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B1t—7 to 10 inches; grayish brown (10YR 5/2) clay loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; hard, friable, sticky and plastic; few thin clay films; neutral; clear smooth boundary.

B21t—10 to 17 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate coarse prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; thin continuous clay films; neutral; clear wavy boundary.

B22t—17 to 25 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, sticky and plastic; many thin continuous clay films; neutral; gradual wavy boundary.

B3—25 to 32 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to weak medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few thin clay films on peds; mildly alkaline; gradual wavy boundary.

C—32 to 60 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; massive; hard, friable, slightly sticky and slightly plastic; mildly alkaline.

The mollic epipedon is 7 to 12 inches thick. Depth to calcareous material ranges from 40 to 60 inches or more. The profile is 0 to 5 percent rock fragments throughout. The A horizon is grayish brown, dark grayish brown, brown, or dark brown. The B2t horizon is yellowish brown, brown, or dark brown. It is neutral or mildly alkaline. The C horizon is pale brown, light yellowish brown, or brown.

Nunn series

The Nunn series consists of deep, well drained soils on alluvial fans and terraces. These soils formed in alluvium. Slope is 0 to 9 percent. The average annual precipitation is 15 to 16 inches, and the average annual air temperature is 48 to 52 degrees F.

These soils are fine, montmorillonitic, mesic Aridic Argiustolls.

Typical pedon of Nunn loam, 0 to 3 percent slopes, 1,400 feet west and 1,000 feet south of the northeast corner of sec. 23, T. 29 S., R. 68 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable, slightly sticky and nonplastic; neutral; abrupt smooth boundary.

B1—4 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate medium angular blocky; slightly hard, friable, sticky and slightly plastic; few thin clay films on peds; neutral; clear smooth boundary.

B21t—7 to 16 inches; brown (10YR 5/3) clay, dark brown (10YR 3/3) moist; strong fine prismatic structure parting to strong fine angular blocky; very hard, firm, very sticky and plastic; many thin clay films on peds; 5 percent gravel; mildly alkaline; gradual wavy boundary.

B22t—16 to 28 inches; brown (10YR 5/3) sandy clay loam, dark brown (10YR 4/3) moist; few fine distinct brownish yellow (10YR 6/6) and black (10YR 2/1) mottles; moderate medium prismatic structure parting to strong medium angular blocky; very hard, friable, sticky and slightly plastic; common thin clay films on peds; moderately alkaline; clear wavy boundary.

B3ca—28 to 39 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; many medium distinct brownish yellow (10YR 6/6) mottles, and few fine distinct black (10YR 2/1) mottles; moderate medium angular blocky structure; very hard, friable, sticky and nonplastic; few thin clay films on peds; calcareous; moderately alkaline; gradual wavy boundary.

Cca—39 to 60 inches; light yellowish brown (10YR 6/4) fine sandy loam, brown (10YR 5/3) moist; common medium distinct yellowish brown (10YR 5/6) mottles, and few fine distinct black (10YR 2/1) mottles; massive; hard, very friable, slightly sticky and nonplastic; calcareous; moderately alkaline.

The depth to calcareous material ranges from 10 to 30 inches. The content of coarse fragments in the profile typically is less than 5 percent but ranges from 0 to 15 percent.

The A1 horizon is dark grayish brown, grayish brown, brown, or dark brown. It is loam, clay loam, or stony sandy clay loam and is neutral or mildly alkaline.

The B2t horizon is brown, grayish brown, or yellowish brown. It is clay or clay loam and averages 35 to 45 percent clay in the upper 20 inches. The horizon is mildly alkaline or moderately alkaline.

The C horizon is fine sandy loam, gravelly sandy loam, clay loam, or loam. The calcium carbonate equivalent is 4 to 14 percent.

Olney series

The Olney series consists of deep, well drained soils on uplands. These soils formed in calcareous eolian

material. Slope is 3 to 12 percent. The average annual precipitation is 13 to 15 inches, and the average annual air temperature is 48 to 54 degrees F.

These soils are fine-loamy, mixed, mesic Ustollic Haplargids.

Typical pedon of Olney sandy loam, 3 to 12 percent slopes, 45 feet west and 210 feet north of the southeast corner of sec. 2, T. 26 S., R. 65 W.

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

B1—3 to 6 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; neutral; clear smooth boundary.

B2t—6 to 13 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; neutral; clear smooth boundary.

B3ca—13 to 18 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; clear smooth boundary.

C1ca—18 to 27 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; hard, very friable, nonsticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

C2—27 to 60 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; calcareous; moderately alkaline.

Calcareous material is at a depth of 10 to 24 inches. The solum is 15 to 30 inches thick. The A horizon is brown, pale brown, grayish brown, or brown. It is sandy loam or fine sandy loam and is neutral or mildly alkaline. The B2t horizon is brown, pale brown, light yellowish brown, or yellowish brown. It is sandy loam or sandy clay loam and is neutral or mildly alkaline. The C horizon is brown, pale brown, light yellowish brown, or yellowish brown. It is sandy loam or fine sandy loam.

Otero series

The Otero series consists of deep, somewhat excessively drained soils on uplands. These soils formed in eolian and alluvial material. Slope is 1 to 12 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 48 to 54 degrees F.

These soils are coarse-loamy, mixed (calcareous), mesic Ustic Torriorthents.

Typical pedon of Otero sandy loam, 1 to 9 percent slopes, 250 feet east and 1,300 feet north of the southwest corner of sec. 2, T. 28 S., R. 64 W.

A1—0 to 7 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; mildly alkaline; clear smooth boundary.

C1—7 to 20 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; calcareous; moderately alkaline; clear smooth boundary.

C2ca—20 to 60 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, nonsticky and nonplastic; few fine soft masses of lime; calcareous; moderately alkaline.

Depth to calcareous material is 0 to 10 inches. The profile is 0 to 15 percent coarse fragments throughout. The A1 horizon is light brownish gray, grayish brown, pale brown, or brown. It is sandy loam or fine sandy loam and is mildly alkaline or moderately alkaline. The C horizon is sandy loam or fine sandy loam. The calcium carbonate equivalent ranges from less than 1 percent to 4 percent.

Patent series

The Patent series consists of deep, well drained soils on fans and foot slopes and in swales. These soils formed in recent alluvium derived from sandstone, siltstone, and shale. Slope is 2 to 8 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 42 to 46 degrees F.

These soils are fine-loamy, mixed (calcareous), frigid Ustic Torriorthents.

Typical pedon of Patent loam, 2 to 8 percent slopes, about 1,360 feet south and 1,980 feet west of the northeast corner of sec. 10, T. 27 S., R. 71 W.

A1—0 to 2 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; 5 percent gravel; calcareous; moderately alkaline; abrupt smooth boundary.

AC—2 to 8 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; 5 percent gravel; calcareous; moderately alkaline; clear smooth boundary.

C1—8 to 37 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; 5 percent gravel; calcareous; moderately alkaline; gradual wavy boundary.

C2—37 to 60 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, very

friable, nonsticky and nonplastic; 10 percent gravel; calcareous; moderately alkaline.

Some pedons have thin strata of gravelly loam 1 inch to 5 inches thick. Calcareous material is at a depth of 0 to 8 inches. The 10- to 40-inch control section averages 0 to 15 percent rock fragments. The A1 horizon is pale brown, brown, dark brown, or grayish brown. It is mildly alkaline or moderately alkaline. Content of gravel in the C horizon in some pedons increases with depth. A few pedons have a few small masses of visible soft lime in the horizon. The C horizon is pale brown, brown, grayish brown, or yellowish brown.

Penrose series

The Penrose series consists of shallow, well drained soils on ridges. These soils formed in residuum and colluvium derived from limestone. Slope is 2 to 25 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 47 to 54 degrees F.

These soils are loamy, carbonatic, mesic Lithic Ustic Torriorthents.

Typical pedon of a Penrose loam in an area of Penrose-Minnequa complex, 2 to 15 percent slopes, 1,050 feet south and 500 feet east of the northwest corner of sec. 8, T. 27 S., R. 63 W.

A1—0 to 7 inches; pale brown (10YR 6/3) channery loam, dark brown (10YR 4/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; 15 percent limestone fragments; calcareous; moderately alkaline; gradual smooth boundary.

AC—7 to 14 inches; pale brown (10YR 6/3) channery loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; 15 percent limestone fragments; calcareous; moderately alkaline; clear irregular boundary.

R—14 to 30 inches; fractured limestone.

Bedrock is at a depth of 10 to 20 inches. The profile is 15 to 35 percent rock fragments. The particle-size control section is 40 to 60 percent calcium carbonate equivalent. The A horizon is light gray, pale brown, or brown.

Potts series

The Potts series consists of deep, well drained soils on uplands. These soils formed in eolian and alluvial material derived dominantly from sandstone. Slope is 1 to 8 percent. The average annual precipitation is 11 to 14 inches, and the average annual air temperature is 48 to 52 degrees F.

These soils are fine-loamy, mixed, mesic Ustollic Haplargids.

Typical pedon of Potts sandy loam, 1 to 8 percent slopes, 2,500 feet south and 1,300 feet east of the northwest corner of sec. 2, T. 26 S., R. 70 W.

A1—0 to 5 inches; pinkish gray (5YR 6/2) sandy loam, dark reddish gray (5YR 4/2) moist; weak very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; mildly alkaline; abrupt smooth boundary.

B1—5 to 8 inches; light reddish brown (5YR 6/3) loam, dark reddish gray (5YR 4/2) moist; weak very fine subangular blocky structure; hard, friable, sticky and plastic; common thin clay films bridging mineral grains; mildly alkaline; abrupt smooth boundary.

B21t—8 to 14 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate fine angular blocky structure; very hard, friable, sticky and plastic; thin continuous clay films on peds; mildly alkaline; abrupt smooth boundary.

B22t—14 to 23 inches; light reddish brown (5YR 6/4) clay loam, reddish brown (5YR 4/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; many thin clay films on peds; calcareous; moderately alkaline; clear wavy boundary.

B3ca—23 to 27 inches; light reddish brown (5YR 6/3) clay loam, reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; common thin clay films on peds; calcareous; moderately alkaline; gradual wavy boundary.

C1ca—27 to 35 inches; light reddish brown (5YR 6/3) loam, reddish brown (5YR 5/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline; gradual wavy boundary.

Cca—35 to 60 inches; light reddish brown (5YR 6/3) sandy loam, reddish brown (5YR 5/4) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; calcareous; strongly alkaline.

Depth to calcareous material ranges from 8 to 20 inches. The A1 horizon is pinkish gray, reddish gray, reddish brown, or light reddish brown. The B2t horizon is light reddish brown or reddish brown. The C horizon is light reddish brown or reddish brown.

Progresso series

The Progresso series consists of moderately deep, well drained soils on uplands. These soils formed in residuum derived from sandstone. Slope is 3 to 15 percent. The average annual precipitation is 14 to 17 inches, and the average annual air temperature is 48 to 52 degrees F.

These soils are fine-loamy, mixed, mesic Ustollic Haplargids.

Typical pedon of a Progresso sandy loam in an area of Olney-Progresso sandy loams, 3 to 15 percent slopes, 2,550 feet north and 1,500 feet east of the southwest corner of sec. 30, T. 28 S., R. 67 W.

A1—0 to 3 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; moderate very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; mildly alkaline; abrupt smooth boundary.

A3—3 to 5 inches; yellowish brown (10YR 5/4) sandy loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.

B2t—5 to 15 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; mildly alkaline; clear irregular boundary.

Cca—15 to 24 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common medium soft masses of lime; calcareous; moderately alkaline; clear irregular boundary.

R—24 inches; sandstone.

Bedrock is at a depth of 20 to 40 inches. Calcareous material is at a depth of 8 to 24 inches. The A1 horizon is brown or yellowish brown. The B2 horizon is brown or yellowish brown. It is sandy clay loam or clay loam. The Cca horizon has 18 to 25 percent calcium carbonate.

Razor series

The Razor series consists of moderately deep, well drained soils on hills. These soils formed in residuum and colluvium derived from shale. Slope is 1 to 20 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 49 to 54 degrees F.

These soils are fine, montmorillonitic, mesic Ustollic Camborthids.

Typical pedon of Razor clay loam, 1 to 12 percent slopes, 650 feet west and 150 feet north of the southeast corner of sec. 18, T. 26 S., R. 66 W.

A1—0 to 3 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; moderate very fine granular structure; soft, very friable, sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

B1—3 to 8 inches; light yellowish brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak medium prismatic structure parting to moderate fine subangular blocky; very hard, friable, sticky and plastic; calcareous; moderately alkaline; clear smooth boundary.

B2—8 to 18 inches; light olive brown (2.5Y 5/4) clay, olive brown (2.5Y 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; calcareous; moderately alkaline; gradual wavy boundary.

B3—18 to 23 inches; light olive brown (2.5Y 5/4) clay, light olive brown (2.5Y 5/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and plastic; calcareous; moderately alkaline; clear wavy boundary.

C1ca—23 to 32 inches; mixed light yellowish brown (2.5Y 6/4) and white (2.5Y 8/2) clay loam, light olive brown (2.5Y 5/4) moist; massive; very hard, firm, very sticky and plastic; calcareous; moderately alkaline; gradual wavy boundary.

C2r—32 inches; soft shale.

Depth to soft shale ranges from 20 to 40 inches. The A horizon is light olive brown, light brownish gray, light yellowish brown, or yellowish brown. It is clay loam or silty clay. The B horizon is grayish brown, yellowish brown, light olive brown, or olive brown. It is silty clay loam, clay, or silty clay. The C horizon is silty clay loam or silty clay. It is slightly saline or moderately saline.

Ring series

The Ring series consists of deep, well drained soils on terraces and terrace side slopes. These soils formed in alluvium. Slope is 2 to 45 percent. The average annual precipitation is 18 to 23 inches, and the average annual air temperature is 38 to 44 degrees F.

These soils are clayey-skeletal, mixed Mollic Eutroboralfs.

Typical pedon of Ring cobbly sandy loam, 2 to 6 percent slopes, 200 feet west and 1,500 feet north of the southeast corner of sec. 2, T. 30 S., R. 68 W.

O1—1 inch to 0; decomposed and decomposing forest litter.

A1—0 to 5 inches; brown (7.5YR 4/2) cobbly sandy loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure parting to weak very fine granular; slightly hard, friable, nonsticky and nonplastic; 10 percent gravel and 10 percent cobbles; slightly acid; clear wavy boundary.

A2—5 to 10 inches; brown (7.5YR 5/4) cobbly sandy loam, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; 5 percent gravel and 10 percent cobbles; slightly acid; gradual wavy boundary.

B21t—10 to 19 inches; brown (7.5YR 5/4) cobbly clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate medium blocky; extremely hard, firm, sticky and plastic;

continuous thin clay films on peds; 10 percent gravel, 15 percent cobbles, and 2 percent stones; slightly acid; clear wavy boundary.

B22t—19 to 28 inches; brown (7.5YR 5/4) very cobbly clay, brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate medium blocky; extremely hard, very firm, very sticky and plastic; continuous thick clay films on peds; 10 percent gravel, 45 percent cobbles, and 2 percent stones; neutral; gradual irregular boundary.

B23t—28 to 37 inches; strong brown (7.5YR 5/6) very cobbly sandy clay, brown (7.5YR 4/4) moist; weak coarse blocky structure; extremely hard, firm, very sticky and plastic; thick continuous clay films on peds; 10 percent gravel, 50 percent cobbles, and 2 percent stones; neutral; gradual irregular boundary.

C—37 to 60 inches; strong brown (7.5YR 5/6) very cobbly sandy clay loam, brown (7.5YR 4/4) moist; massive; extremely hard, firm, very sticky and plastic; 5 percent gravel, 55 percent cobbles, and 5 percent stones; neutral.

The A horizon is brown, dark brown, grayish brown, or dark grayish brown. It is cobbly sandy loam or cobbly loam. Some profiles do not have an A2 horizon. The B2t horizon averages very cobbly clay or very cobbly sandy clay. It averages 35 to 65 percent rock fragments. The C horizon is brown or strong brown. It is 45 to 70 percent rock fragments.

Rogert series

The Rogert series consists of shallow, well drained soils on mountainsides and ridges. These soils formed in residuum derived from granite. Slope is 15 to 65 percent. The average annual precipitation is 18 to 23 inches, and the average annual air temperature is 38 to 42 degrees F.

These soils are loamy-skeletal, mixed Lithic Cryoborolls.

Typical pedon of a Rogert gravelly sandy loam in an area of Montez-Rogert complex, 15 to 65 percent slopes, on the Mosca Pass Road, 2,600 feet west of the southeast corner of sec. 33, T. 26 S., R. 72 W.

A1—0 to 7 inches; grayish brown (10YR 5/2) gravelly sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; 25 percent gravel; neutral; clear wavy boundary.

AC—7 to 14 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 4/3) moist; moderate medium granular structure; hard, friable, nonsticky and nonplastic; 60 percent gravel; neutral; clear irregular boundary.

R—14 inches; fractured granite.

The mollic epipedon ranges from 7 to 16 inches in thickness. Depth to bedrock is 10 to 20 inches. The control section is 5 to 18 percent clay and averages 35 to 80 percent rock fragments. The A1 horizon is grayish brown, dark grayish brown, or brown. It is gravelly sandy loam or very cobbly loam.

Schamber series

The Schamber series consists of deep, excessively drained soils on hills and terrace edges. These soils formed in gravelly alluvium. Slope is 3 to 25 percent. The average annual precipitation is 12 to 16 inches, and the average annual air temperature is 47 to 54 degrees F.

These soils are sandy-skeletal, mixed, mesic Ustic Torriorthents.

Typical pedon of Schamber gravelly sandy loam, 3 to 15 percent slopes, 1,200 feet south and 400 feet west of the northeast corner of sec. 24, T. 26 S., R. 68 W.

A1—0 to 4 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; slightly hard, very friable, slightly sticky and nonplastic; 30 percent gravel; mildly alkaline; clear smooth boundary.

AC—4 to 12 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 50 percent gravel and 10 percent cobbles; calcareous; moderately alkaline; gradual smooth boundary.

Cca—12 to 60 inches; light brown (7.5YR 6/4) very gravelly loamy sand, brown (7.5YR 4/4) moist; single grain; loose; 50 percent gravel and 15 percent cobbles; calcium carbonate accumulation on bottom of rock fragments; calcareous; moderately alkaline.

The 10- to 40-inch control section is 35 to 80 percent coarse fragments. The profile commonly is calcareous throughout, but in some pedons carbonates are leached from the upper 6 to 8 inches. The A horizon is pale brown, brown, or grayish brown. It is mildly alkaline or moderately alkaline. The C horizon is very gravelly to extremely gravelly loamy sand or very gravelly to extremely gravelly sand.

Tisworth series

The Tisworth series consists of deep, well drained soils on alluvial fans. These soils formed in alluvium. Slope is 2 to 8 percent. The average annual precipitation is 11 to 15 inches, and the average annual air temperature is 43 to 45 degrees F.

These soils are fine-loamy, mixed Borollic Natrargids.

Typical pedon of Tisworth sandy loam, 2 to 8 percent slopes, 750 feet south and 1,700 feet east of the northwest corner of sec. 1, T. 26 S., R. 71 W.

A2—0 to 3 inches; pinkish gray (7.5YR 6/2) sandy loam, brown (7.5YR 5/2) moist; weak very fine granular

structure; soft, very friable, nonsticky and nonplastic; 5 percent cobbles; moderately alkaline; abrupt smooth boundary.

B21tca—3 to 7 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate medium columnar structure parting to moderate medium subangular blocky; very hard, friable, sticky and plastic; few thin clay films on peds; 5 percent gravel; calcareous; strongly alkaline; abrupt smooth boundary.

B22tcasa—7 to 15 inches; reddish brown (5YR 5/3) clay loam, reddish brown (5YR 4/3) moist; weak medium columnar structure parting to moderate fine and medium subangular blocky; very hard, friable, sticky and plastic; common thin clay films on peds; common seams and streaks of salt and secondary calcium carbonate; 5 percent gravel; calcareous; strongly alkaline; clear smooth boundary.

B3ca—15 to 24 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; weak coarse subangular blocky structure; hard, very friable, slightly plastic; few streaks of secondary calcium carbonate; calcareous; strongly alkaline; gradual smooth boundary.

C1ca—24 to 45 inches; light reddish brown (5YR 6/3) stratified loam and sandy loam, reddish brown (5YR 5/3) moist; weak coarse platy structure; hard, very friable, slightly sticky and slightly plastic; calcareous; strongly alkaline; gradual wavy boundary.

C2ca—45 to 60 inches; light reddish brown (5YR 6/4) sandy loam, reddish brown (5YR 5/4) moist; massive; loose; very friable, nonsticky and nonplastic; 5 percent gravel; calcareous; strongly alkaline.

The profile is 0 to 15 percent rock fragments that are dominantly less than 3 inches in diameter. Calcareous material is at a depth of 0 to 10 inches. The A horizon is pinkish gray or brown. The B2t horizon is reddish gray or reddish brown. Exchangeable sodium content ranges from 15 to 40 percent. The C horizon is moderately alkaline or strongly alkaline.

Tolman series

The Tolman series consists of shallow, well drained soils on mountainsides. These soils formed in residuum and colluvium derived from sandstone. Slope is 25 to 50 percent. The average annual precipitation is 18 to 25 inches, and the average annual air temperature is 38 to 44 degrees F.

These soils are loamy-skeletal, mixed Lithic Argiborolls.

Typical pedon of a Tolman stony sandy loam in an area of Tolman-Rock outcrop complex, 25 to 65 percent slopes, on a southeast-facing side slope about 1,500 feet north and 400 feet west of the southeast corner of sec. 1, T. 29 S., R. 70 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) stony sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; 15 percent stones, 10 percent cobbles, and 5 percent gravel; neutral; clear smooth boundary.

A3—4 to 8 inches; reddish brown (5YR 4/3) stony sandy loam, dark reddish brown (5YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; 15 percent stones, 10 percent cobbles, and 10 percent gravel; neutral; clear wavy boundary.

B2t—8 to 18 inches; reddish brown (5YR 4/3) very stony sandy clay loam, reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; 25 percent stones, 10 percent cobbles, and 15 percent gravel; neutral; abrupt irregular boundary.

R—18 inches; hard sandstone.

Bedrock is at a depth of 10 to 20 inches. The A horizon is slightly acid or neutral. It is 15 to 35 percent rock fragments. The B2t horizon is reddish gray, dark reddish gray, or reddish brown. It is 35 to 65 percent rock fragments. Some pedons have a thin C horizon.

Torriorthents

Torriorthents consists of shallow and moderately deep, well drained soils on side slopes of deeply dissected terraces on foothills. These soils formed in material derived from interbedded, fine-grained sandstone, siltstone, and shale. Slope is 5 to 40 percent. The average annual precipitation is 10 to 14 inches, and the average annual air temperature is 45 to 52 degrees F.

Reference pedon of Torriorthents in an area of Ustic Torriorthents-Rock outcrop complex, 5 to 40 percent slopes, 1 mile east and 2 miles north of Gardner, Colorado, about 900 feet south and 700 feet east of the northwest corner of sec. 7, T. 26 S., R. 69 W.

A1—0 to 3 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist; weak very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium roots; 20 percent gravel; calcareous; moderately alkaline; clear smooth boundary.

C1—3 to 15 inches; dark reddish gray (5YR 4/2) clay loam, dark reddish gray (5YR 4/2) moist; moderate fine angular blocky rock structure; very hard, firm, slightly sticky and slightly plastic; few fine and medium roots; calcareous; moderately alkaline; gradual wavy boundary.

C2r—15 inches; weathered siltstone.

Depth to bedrock ranges from 10 to 35 inches. The profile is 0 to 20 percent gravel. It is nonsaline or slightly saline. The A horizon is clay loam, fine sandy loam,

loam, or gravelly loam. It is grayish brown to dark brown. The C horizon is brown, grayish brown, reddish gray, or dark reddish gray to reddish brown. It is moderately alkaline to strongly alkaline. The C horizon is clay loam, fine sandy loam, gravelly clay loam, or gravelly fine sandy loam.

Trag series

The Trag series consists of deep, well drained soils on benches and foot slopes. These soils formed in medium-textured alluvium and colluvium. Slope is 3 to 12 percent. The average annual precipitation is 18 to 23 inches, and the average annual air temperature is 38 to 45 degrees F.

These soils are fine-loamy, mixed Typic Argiborolls.

Typical pedon of Trag loam, 3 to 12 percent slopes, 900 feet north and 300 feet west of the southeast corner of sec. 11, T. 30 S., R. 68 W.

A1—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and nonplastic; neutral; gradual wavy boundary.

B1—8 to 15 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 3/2) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common thin clay films on peds; neutral; clear wavy boundary.

B2t—15 to 39 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; continuous thin clay films on peds; neutral; clear wavy boundary.

B3—39 to 58 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; hard, very friable, sticky and plastic; many thin clay films on peds; neutral; gradual wavy boundary.

C—58 to 60 inches; brown (7.5YR 5/4) sandy clay loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; neutral.

The mollic epipedon is 7 to 16 inches thick. The solum is 0 to 15 percent rock fragments. The A1 horizon is dark brown or very dark grayish brown. The B horizon is brown or light brown.

Travessilla series

The Travessilla series consists of shallow, well drained soils on side slopes and ridgetops. These soils formed in residuum derived from sandstone. Slope is 1 to 45 percent. The average annual precipitation is about 11 to 16 inches, and the average annual air temperature is 48 to 54 degrees F.

These soils are loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents.

Typical pedon of a Travessilla channery sandy loam in an area of Travessilla-Kim complex, 1 to 9 percent slopes, 1,250 feet east and 2,520 feet south of the northwest corner of sec. 31, T. 26 S., R. 63 W.

A1—0 to 6 inches; light brownish gray (10YR 6/2) channery sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; 15 percent channery fragments of sandstone; calcareous; mildly alkaline; clear smooth boundary.

Cca—6 to 15 inches; pale brown (10YR 6/3) channery sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 25 percent channery fragments of sandstone; disseminated lime and streaks and soft masses of lime; calcareous; moderately alkaline; abrupt smooth boundary.

R—15 inches; sandstone.

Depth to bedrock ranges from 6 to 20 inches. The A horizon is light brownish gray, pale brown, grayish brown, or brown. It is mildly alkaline or moderately alkaline. The C horizon is pale brown, brown, or light yellowish brown. It is mildly alkaline or moderately alkaline. This horizon is 0 to 35 percent rock fragments.

Uinta series

The Uinta series consists of deep, well drained soils on mountaintops and benches. These soils formed in residuum and colluvium derived from sandstone. Slope is 4 to 25 percent. The average annual precipitation is 20 to 25 inches, and the average annual air temperature is 38 to 42 degrees F.

These soils are fine-loamy, mixed Typic Cryoboralfs.

Typical pedon of a Uinta fine sandy loam in an area of Uinta-Lakehelen fine sandy loams, 4 to 25 percent slopes, 300 feet north of the southeast corner of sec. 4, T. 28 S., R. 70 W.

O1—1 inch to 0; undecomposed forest litter consisting of needles, bark, and twigs.

A1—0 to 3 inches; brown (7.5YR 4/2) fine sandy loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; neutral; gradual wavy boundary.

A2—3 to 15 inches; pinkish gray (7.5YR 6/2) sandy loam, brown (7.5YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; neutral; gradual wavy boundary.

B&A—15 to 19 inches; mixed reddish brown (5YR 5/4) and pinkish gray (7.5YR 6/2) sandy clay loam

(composite texture), reddish brown (5YR 4/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, friable, slightly sticky and slightly plastic; neutral; clear wavy boundary; 70 percent of the horizon is B material that is coated with A material.

B2t—19 to 44 inches; reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/3) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; thin continuous clay films on peds; neutral; clear wavy boundary.

B3—44 to 52 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; thin patchy clay films on peds; neutral; gradual smooth boundary.

C1—52 to 60 inches; reddish brown (5YR 4/4) sandy clay loam, reddish brown (5YR 4/4) moist; massive; hard, friable, sticky and plastic; neutral; gradual smooth boundary.

The A2 horizon is pale brown, light brown, or pinkish gray. It is slightly acid or neutral. The B horizon is light reddish brown or reddish brown. It is 0 to 35 percent rock fragments. The C horizon is light reddish brown or reddish brown. It is 0 to 35 percent rock fragments.

Utica series

The Utica series consists of deep, excessively drained soils on terraces and fans. These soils formed in alluvium. Slope is 2 to 10 percent. The average annual precipitation is 14 to 18 inches, and the average annual air temperature is 42 to 45 degrees F.

These soils are sandy-skeletal, carbonatic Typic Calciborolls.

Typical pedon of Utica gravelly sandy loam, 2 to 10 percent slopes, about 1,700 feet east and 1,900 feet north of the southwest corner of sec. 14, T. 26 S., R. 71 W.

A1—0 to 7 inches; brown (10YR 5/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, very friable, nonsticky and nonplastic; 20 percent gravel; calcareous; mildly alkaline; abrupt smooth boundary.

AC—7 to 15 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; 5 percent cobbles and 20 percent gravel; calcareous; mildly alkaline; gradual wavy boundary.

C1ca—15 to 36 inches; white (10YR 8/1) very gravelly loamy sand, light gray (10YR 7/1) moist; massive; very hard, friable, nonsticky and nonplastic; 15 percent cobbles and 40 percent gravel; calcareous; moderately alkaline; clear smooth boundary.

C2ca—36 to 60 inches; very pale brown (10YR 7/4) very gravelly loamy sand, light yellowish brown (10YR 6/4) moist; single grain; loose; very friable, nonsticky and nonplastic; 15 percent cobbles and 40 percent gravel; calcareous; moderately alkaline.

The 10- to 40-inch control section is 35 to 60 percent coarse fragments. The calcic horizon averages 40 to 50 percent calcium carbonate. The A horizon is dark grayish brown, grayish brown, dark brown, or brown. It is mildly alkaline or moderately alkaline. The C horizon is very gravelly sand or very gravelly loamy sand.

Vona series

The Vona series consists of deep, well drained soils on undulating uplands. These soils formed in eolian material. Slope is 1 to 5 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 50 to 54 degrees F.

These soils are coarse-loamy, mixed, mesic Ustollic Haplargids.

Typical pedon of Vona fine sandy loam, 1 to 5 percent slopes, 1,150 feet north and 1,400 feet west of the southeast corner of sec. 29, T. 26 S., R. 63 W.

A1—0 to 6 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; neutral; clear smooth boundary.

B2t—6 to 17 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure parting to weak or moderate medium subangular blocky; slightly hard, friable, slightly sticky and nonplastic; few thin clay films on peds; neutral; clear smooth boundary.

B3ca—17 to 32 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; slightly hard, very friable, nonsticky and nonplastic; calcareous; moderately alkaline; clear smooth boundary.

Cca—32 to 60 inches; pale brown (10YR 6/3) sandy loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, nonsticky and nonplastic; calcareous; moderately alkaline.

Depth to calcareous material ranges from 8 to 24 inches. The solum is 15 to 40 inches thick. The A horizon is light brownish gray, grayish brown, pale brown, or brown. It is neutral or mildly alkaline. The B2 horizon is pale brown or brown. It is neutral or mildly alkaline.

Wahatoya series

The Wahatoya series consists of moderately deep, well drained soils on side slopes. These soils formed in residuum derived from conglomeritic sandstone. Slope is 35 to 65 percent. The average annual precipitation is 17

to 20 inches, and the average annual air temperature is 40 to 44 degrees F.

These soils are loamy-skeletal, mixed Typic Eutroboralfs.

Typical pedon of a Wahatoya gravelly sandy loam in an area of Wahatoya-Rock outcrop complex, 35 to 65 percent slopes, 1,580 feet west and 600 feet north of the southeast corner of sec. 3, T. 30 S., R. 68 W.

O2—1 inch to 0; decomposed forest litter derived from twigs and leaves.
A1—0 to 2 inches; dark brown (7.5YR 4/2) gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; 10 percent gravel, 5 percent cobbles, and 1 percent stones; neutral; clear wavy boundary.
A2—2 to 6 inches; pinkish gray (7.5YR 6/2) gravelly sandy loam, dark brown (7.5YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; 20 percent gravel and 5 percent cobbles; neutral; clear wavy boundary.
B2t—6 to 22 inches; brown (7.5YR 5/2) very gravelly sandy clay loam, dark brown (7.5YR 4/4) moist; weak fine subangular blocky structure; very hard, friable, sticky and plastic; few thin patchy clay films on peds; 40 percent gravel; neutral; gradual wavy boundary.
C1—22 to 26 inches; brown (7.5YR 5/4) very gravelly sandy loam, dark brown (7.5YR 4/4) moist; massive; very hard, firm, nonsticky and nonplastic; 50 percent gravel; neutral; clear wavy boundary.
R—26 inches; hard conglomeritic sandstone.

Bedrock is at a depth of 20 to 40 inches. The A2 horizon is pinkish gray, pale brown, or light brownish gray. The B2t horizon is reddish brown or brown. It is 35 to 60 percent rock fragments.

Welring series

The Welring series consists of shallow, well drained soils on ridges. These soils formed in residuum and colluvium derived from limestone. Slope is 4 to 25 percent. The average annual precipitation is 12 to 14 inches, and the average annual air temperature is 47 to 52 degrees F.

These soils are loamy-skeletal, carbonatic, mesic Lithic Ustic Torriorthents.

Typical pedon of Welring very channery loam, 4 to 25 percent slopes, at the center of sec. 14, T. 26 S., R. 68 W.

A1—0 to 4 inches; light brownish gray (10YR 6/2) very channery loam, brown (10YR 5/3) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; 45 percent limestone fragments; calcareous; moderately alkaline; clear smooth boundary.
AC—4 to 18 inches; light gray (10YR 7/2) very channery loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; 60 percent limestone fragments; calcareous; moderately alkaline; clear wavy boundary.
R—18 inches; hard limestone.

Bedrock is at a depth of 8 to 20 inches. Uniformly calcareous material is at a depth of 0 to 5 inches. The particle-size control section is 50 to 70 percent calcium carbonate equivalent. The A horizon is light brownish gray, light gray, grayish brown, or brown. The C horizon is light gray, pale brown, or very pale brown.

Wetmore series

The Wetmore series consists of shallow, well drained soils on mountainsides and ridges. These soils formed in residuum derived from granite. Slope is 20 to 50 percent. The average annual precipitation is 23 to 25 inches, and the average annual air temperature is 42 to 44 degrees F.

These soils are loamy-skeletal, mixed Lithic Eutroboralfs.

Typical pedon of a Wetmore very gravelly coarse sandy loam in an area of Wetmore-Mortenson association, 20 to 50 percent slopes, 550 feet north and 400 feet east of the southwest corner of sec. 12, T. 25 S., R. 68 W.

O1—2 inches to 0; twigs and oak leaves and undecomposed ponderosa pine needles.
A1—0 to 1 inch; grayish brown (10YR 5/2) very gravelly coarse sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, nonsticky and nonplastic; 40 percent gravel and 15 percent cobbles; neutral; clear smooth boundary.
A2—1 inch to 5 inches; brown (10YR 5/3) very gravelly coarse sandy loam, dark brown (10YR 4/3) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; 40 percent gravel and 15 percent cobbles; neutral; clear smooth boundary.
A&B—5 to 10 inches; pale brown (10YR 6/3) very gravelly coarse sandy loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; 40 percent gravel and 15 percent cobbles; neutral; clear smooth boundary.
B2t—10 to 14 inches; pale brown (10YR 6/3) extremely gravelly coarse sandy loam, brown (10YR 4/3) moist; moderate fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; thin discontinuous clay films; 45 percent gravel and 20 percent cobbles; neutral; clear wavy boundary.
R—14 inches; granite.

Bedrock is at a depth of 8 to 20 inches. The profile is 35 to 75 percent rock fragments, dominantly gravel and cobbles. It is slightly acid or neutral. The A1 horizon, where present, is grayish brown, dark grayish brown, brown, or dark brown. The A2 horizon is light brownish gray, grayish brown, pinkish gray, or light brown. The B2t horizon is brown, dark brown, or yellowish red.

Wiley series

The Wiley series consists of deep, well drained soils on uplands. These soils formed in calcareous loess. Slope is 1 to 5 percent. The average annual precipitation is 12 to 15 inches, and the average annual air temperature is 50 to 54 degrees F.

These soils are fine-silty, mixed, mesic Ustollic Haplargids.

Typical pedon of Wiley loam, 1 to 3 percent slopes, 150 feet south and 2,580 feet west of the northeast corner of sec. 23, T. 29 S., R. 65 W.

A1—0 to 4 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; mildly alkaline; clear smooth boundary.

B21t—4 to 10 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common thin clay films; calcareous; moderately alkaline; clear smooth boundary.

B22tca—10 to 14 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak medium prismatic structure parting to weak and moderate medium subangular blocky; hard, friable, sticky and plastic; common thin clay films; small soft masses of secondary calcium carbonate; calcareous; moderately alkaline; clear smooth boundary.

B3ca—14 to 23 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; weak coarse prismatic structure parting to weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; soft masses of secondary calcium carbonate; calcareous; moderately alkaline; gradual smooth boundary.

Cca—23 to 60 inches; very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; filaments and soft masses of secondary calcium carbonate; calcareous; moderately alkaline.

Uniformly calcareous material is at a depth of 0 to 7 inches. A continuous accumulation of secondary calcium carbonate is at a depth of 10 to 24 inches. The A horizon is brown, pale brown, grayish brown, light brownish gray, or light gray. The B2t horizon is brown, pale brown, light brownish gray, grayish brown, or brown. It is silt loam or silty clay loam. The C horizon is silt loam, loam, or silty clay loam.

Willowman series

The Willowman series consists of deep, well drained soils on terraces and fans. These soils formed in cobbly and gravelly alluvium. Slope is 3 to 30 percent. The average annual precipitation is 16 to 20 inches, and the average annual air temperature is 48 to 52 degrees F.

These soils are loamy-skeletal, mixed, mesic Aridic Argiustolls.

Typical pedon of Willowman gravelly sandy loam, 3 to 8 percent slopes, 2,400 feet north and 200 feet west of the southeast corner of sec. 29, T. 28 S., R. 68 W.

A1—0 to 5 inches; brown (7.5YR 5/2) gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; 10 percent gravel and 5 percent cobbles; mildly alkaline; clear smooth boundary.

A3—5 to 8 inches; brown (7.5YR 4/2) gravelly sandy loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; hard, very friable, sticky and slightly plastic; 20 percent gravel and 10 percent cobbles; mildly alkaline; clear smooth boundary.

B2t—8 to 15 inches; brown (7.5YR 4/4) very cobbly sandy clay loam, brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; very hard, friable, sticky and plastic; continuous thin clay films on peds; 30 percent gravel and 20 percent cobbles; mildly alkaline; abrupt wavy boundary.

C1—15 to 21 inches; pink (7.5YR 7/4) very cobbly sandy loam, light brown (7.5YR 6/4) moist; weak coarse subangular blocky structure; hard, very friable, sticky and slightly plastic; 35 percent gravel, 25 percent cobbles, and 5 percent stones; calcareous; moderately alkaline; clear wavy boundary.

IIC2ca—21 to 44 inches; white (7.5YR 8/0) very gravelly loamy sand, pinkish gray (7.5YR 6/2) moist; massive; soft, very friable, nonsticky and nonplastic; 35 percent gravel, 15 percent cobbles, and 5 percent stones; calcareous; moderately alkaline; gradual irregular boundary.

IIC3—44 to 60 inches; pinkish gray (7.5YR 6/2) very gravelly sand, brown (7.5YR 4/2) moist; single grain; loose; 35 percent gravel and 2 percent cobbles; calcareous; moderately alkaline.

Depth to calcareous material ranges from 10 to 20 inches. The calcic horizon averages 15 to 40 percent calcium carbonate. The A horizon is brown, dark brown, or dark grayish brown. The B and C horizons average 35 to 70 percent gravel, cobbles, and stones. The B horizon is dark grayish brown, dark yellowish brown, brown, or

dark brown. It is very cobbly sandy clay loam or very gravelly sandy clay loam. The C horizon is dark brown, pink, pinkish gray, or white.

Woodhall series

The Woodhall series consists of moderately deep, well drained soils on mountains. These soils formed in residuum and colluvium derived from igneous and sedimentary rock. Slope is 5 to 50 percent. The average annual precipitation is 20 to 25 inches, and the average annual air temperature is about 38 to 42 degrees F.

These soils are loamy-skeletal, mixed Argic Cryoborolls.

Typical pedon of a Woodhall loam in an area of Woodhall-Rock outcrop complex, 5 to 20 percent slopes, 950 feet west and 800 feet south of the northeast corner of sec. 11, T. 29 S., R. 70 W.

A1—0 to 8 inches; brown (10YR 5/3) loam, very dark brown (10YR 2/2) moist; strong very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; 10 percent gravel; neutral; clear wavy boundary.

B2t—8 to 17 inches; yellowish brown (10YR 5/4) very stony clay loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; hard, very friable, sticky and plastic; 10 percent gravel, 15 percent cobbles, and 20 percent stones; neutral; clear irregular boundary.

C—17 to 26 inches; yellowish brown (10YR 5/6) extremely cobbly loam, dark yellowish brown (10YR 4/4) moist; single grain; soft, very friable, nonsticky and nonplastic; 75 percent cobbles; neutral; gradual irregular boundary.

R—26 inches; highly fractured sandstone.

Bedrock is at a depth of 20 to 40 inches. The profile is slightly acid or neutral. Most of it is 35 to 75 percent coarse fragments. The A horizon is dark grayish brown, dark brown, or brown. It is loam or gravelly loam. The B horizon is brown, yellowish brown, or dark yellowish brown. It is very stony clay loam or very cobbly loam and is 20 to 35 percent clay.

formation of the soils

This section discusses the factors of soil formation and relates them to the formation of the soils in the survey area (*12*).

Soil is formed by the interaction of five factors. These factors are (1) the physical and mineralogical composition of the parent material; (2) the climate under which the parent material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time these forces have acted on the parent material. Each of these factors of soil formation is important but, in different locations and under different conditions, some are more effective than others. In areas where one factor varies widely, many different soils are formed. The five main factors of soil formation are discussed in the following pages.

parent material

The soils in the survey area formed from many kinds of parent material. Differences in the physical, chemical, and mineralogical properties of this material have influenced soil formation. The parent material also to a large extent determines the texture, color, consistence, and other soil profile characteristics. The kinds of parent material in the area are discussed in the following paragraphs.

Alluvium is present as recent flood plain and bottom land deposits and as older terraces and fans.

The recent flood plain deposits are on low terraces and bottom lands adjacent to channels of the Cucharas and Huerfano Rivers and their tributaries. These stratified deposits range from sandy loam to clay and are underlain by sand and gravel in many areas. A fluctuating water table is common in low-lying areas. The Las Animas, Glenberg, Haverson, Limon, Collegiate, Manzano, and Crooked Creek soils formed on these low terraces and bottom lands.

Alluvial deposits on older terraces and fans are the result of runoff and erosion. These deposits are better sorted and are less stratified than those of the flood plains. The soils commonly are high in content of rock fragments. They have a B horizon or a layer of lime accumulation, or both. The Schamber, Cascajo, Willowman, and Morop soils formed on terraces and fans.

Wind deposited sediment consists of loess, eolian sand, and silt. The loess deposits are on gently sloping uplands of plains. The Baca and Wiley soils formed in loess. Eolian sand and silt are on gently sloping and gently undulating uplands of plains and foothills. Texture dominantly is sandy loam or loam. The Vona, Otero, Kim, and Potts soils formed in eolian sand and silt.

Sedimentary rock consists of sandstone, siltstone, limestone, and shale. It is on plains, foothills, and mountains.

The sedimentary rock on plains includes Dakota Sandstone, Limestone, and Shale of the Niobrara Formation, Pierre Shale, and some Carlile Shale, Greenhorn Limestone, and Ganerous Shale. The soils that formed in material from these formations developed in residuum and colluvium on nearly level to very steep ridges, side slopes, uplands, foot slopes, and hills. Texture ranges from sandy loam to clay, depending on the parent material. The Travessilla soils formed in material derived from sandstone, the Manvel and Penrose soils formed in material derived from limestone, and the Razor and Midway soils formed in material derived from shale.

The sedimentary rock on the foothills and mountains mainly consists of the Raton, Poison Canyon, Cuhera, Huerfano, and Devils Hole Formations. The soils derived from these formations formed in colluvium and residuum. Torriorthents and Castner soils formed in material derived from interbedded shale, siltstone, and sandstone on moderately sloping to extremely steep mountainsides and on the sides of deeply dissected terraces. The Bond, Badito, Tolman, and Farisita soils formed in material derived from sandstone on gently sloping to extremely steep ridges and side slopes. The Goemmer, Louviers, Holderness, and Fughes soils are examples of soils that formed in material derived from shale or siltstone on moderately steep to extremely steep foot slopes, benches, and side slopes.

Igneous rock is mainly granite, gabbro, syenite, and felsite. It is on gently sloping to very steep mountains and ridges. The Wetmore, Rogert, and Woodhall soils formed in residuum and colluvium derived from igneous rock.

climate

Through its influence on the vegetation, the rate of biological activity, and the chemical weathering of parent material, climate has been important in the development of the soils in this survey area. Soil temperature and

moisture are the main factors. Other factors such as wind velocity, humidity, elevation, and aspect also have a significant influence on soil formation.

The survey area has a semiarid continental climate; however, microclimates occur in the area because of differences in elevation and aspect. The average annual precipitation ranges from 10 inches at Rattlesnake Butte to about 30 inches in the mountains. Summers usually are warm or hot on the plains and foothills but are much cooler in the mountains. Winters are cold in the mountains and mild on the foothills and plains. The average annual temperature ranges from 38 degrees F in the mountains to about 55 degrees at the lower elevations. The frost-free season ranges from 40 days to about 165 days.

The Gardner area and the eastern part of the survey area receive less precipitation than the La Veta area and the mountains. Most soils in the drier areas are calcareous at the surface, while most soils in the moister areas have carbonates and other bases leached to a depth of 2 feet or more. The organic matter content is lower in the drier areas as a result of less root development, less biologic activity, and warm temperatures. The warmer the temperature, the more rapidly organic matter decomposes.

Wind velocity has influenced the formation of soils. The average windspeed at Walsenburg is 7.6 miles per hour. It is highest in April, when it averages 10.4 miles per hour. As moisture evaporates, the biologic activity in the soils decreases. Several soils in the survey area formed in wind-deposited silt and sand.

plant and animal life

Plant and animal life on or in the soil influences soil formation by affecting the thickness, structure, and organic matter content of the soil. The kinds of plant and animal life are controlled by soil temperature, soil moisture, and the physical and chemical characteristics of the soil.

The native vegetation of the soils in the survey area is mainly grasses and forest. Grasses are important in soil formation on the plains in the eastern part of the area and on the fans and terraces adjacent to the Culebra, Sangre de Cristo, and Wet Mountains. The soils that formed under grasses commonly have high organic matter content and a dark-colored surface layer. Because of low precipitation, the organic matter content of the soils on the plains is supplied by decomposing roots and these soils do not have a dark-colored surface layer.

Coniferous forests are mainly in the mountains and associated foothills. Soils that formed under coniferous forest vegetation commonly have low organic matter content in the surface layer because of the absence of the many fine roots that are typical of grasslands.

The number and kinds of living organisms are significant to the development of soils. Micro-organisms use organic matter as a source of food and convert it into humus. Earthworms and burrowing animals, such as gophers and badgers, mix the soils.

relief

In many areas relief is the most important factor in determining the kinds of soil that form on a particular landscape. Relief affects the formation of soils through its influence on drainage, runoff, and erosion. Internal drainage and moisture content differ in areas of different relief. Runoff generally is more rapid in the more steeply sloping areas.

Unless good plant cover is maintained in steeply sloping areas, soil erosion can remove soil material faster than it forms. A thin surface layer and limited development of the subsoil are characteristic of steeply sloping soils.

Runoff water tends to concentrate in depressional areas. These areas commonly have a thick, dark-colored surface layer.

Aspect affects soil formation through its effect on the orientation of the soil relative to the sun. North-facing slopes are cooler, and subsequently moisture is more effective on these slopes than on south-facing slopes.

time

The formation of soil requires time. The length of time required depends on the kind of parent material present. The process of rock weathering and the formation of soil horizons in the weathered parent material generally occur simultaneously in soils that formed in residuum. In transported, unconsolidated material, such as alluvium, soil formation begins when the material is stabilized.

Specific soil characteristics reflect the length of time a landform has been stable. Soil characteristics used to determine the comparative maturity of soils are stratification, thickness, color, degree of structure, evidence of clay movement, depth to calcium carbonate accumulations, and thickness of the solum. Older soils typically have more distinctive genetic horizons.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

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. 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.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

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.

Association, soil. A group of soils 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—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

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.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

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.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural

class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay 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.

Climax vegetation. 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.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil 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 are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. 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.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most

mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

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.

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 the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are 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, and clay.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

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.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

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.

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 upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

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 A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

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.

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.

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

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—
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.
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
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.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

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 (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

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.

Park. An open area surrounded or partly surrounded by woodland and suitable for grazing or cultivation.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pediment. A gently sloping erosional surface developed at the foot of a receding rill or mountain slope.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

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.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

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.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

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.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

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.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

	Percent
Nearly level	0 to 2
Gently sloping	2 to 7
Moderately sloping	7 to 13
Moderately steep	13 to 25
Very steep	25 to 55
Extremely steep	55 and higher

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium absorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $Ca^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

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 mm in equivalent diameter and ranging between specified

size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
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 and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind 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 grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

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 a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

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."

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.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

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.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

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.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-73 at Walsenburg Power Plant, Colo.]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	46.7	21.2	34.0	65	-16	62	.54	.10	.81	2	9.6
February---	48.9	22.3	35.7	69	-11	85	.89	.32	1.34	3	12.8
March------	53.4	25.1	39.3	74	-5	136	1.28	.70	1.75	4	15.1
April------	63.2	33.2	48.2	81	10	263	1.80	.87	2.55	4	10.9
May--------	73.0	62.4	57.7	89	25	549	1.99	.76	2.97	4	1.5
June-------	83.0	50.7	66.9	96	37	807	1.15	.62	1.74	3	.0
July-------	86.8	56.6	71.7	97	45	983	2.11	.91	3.00	5	.0
August-----	84.6	53.3	70.0	95	44	930	1.73	.78	2.49	4	.0
September--	78.5	47.7	63.1	90	30	693	.90	.29	1.38	2	.7
October----	68.3	38.1	53.2	84	16	409	1.11	.24	1.79	3	6.2
November---	55.0	27.7	41.4	74	-3	138	.82	.43	1.14	3	8.9
December---	47.9	22.3	35.1	63	-10	41	.79	.24	1.13	3	11.8
Year-----	65.8	36.9	51.4	98	-21	5,096	15.06	2.21	17.74	40	77.5

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-73
at Walsenburg Power Plant, Colo.]

Probability	Minimum temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 28	May 9	May 23
2 years in 10 later than--	April 24	May 5	May 19
5 years in 10 later than--	April 16	April 27	May 11
First freezing temperature in fall:			
1 year in 10 earlier than--	October 10	September 30	September 15
2 years in 10 earlier than--	October 15	October 6	September 22
5 years in 10 earlier than--	October 27	October 17	October 3

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-73
at Walsenburg Power Plant, Colo.]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	172	153	125
8 years in 10	179	159	132
5 years in 10	193	172	147
2 years in 10	206	185	161
1 year in 10	213	191	169

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Apishapa silty clay	1,640	0.2
2	Baca loam, 1 to 3 percent slopes	17,600	2.0
3	Badito very cobbly sandy loam, 25 to 60 percent slopes	5,560	0.6
4	Bayerton-Maitland complex, 25 to 50 percent slopes	9,320	1.1
5	Benteen-Rock outcrop complex, 3 to 18 percent slopes	3,280	0.4
6	Bond-Rock outcrop complex, 15 to 45 percent slopes	5,800	0.7
7	Breece sandy loam, 2 to 18 percent slopes	9,840	1.1
8	Brownsto very gravelly loam, 3 to 15 percent slopes	25,240	2.9
9	Brownsto very channery loam, 15 to 75 percent slopes	11,760	1.3
10	Castner very channery loam, 20 to 70 percent slopes	18,200	2.1
11	Coldcreek cobbly sandy loam, 25 to 80 percent slopes	4,640	0.5
12	Collegiate loam, 1 to 3 percent slopes	5,960	0.7
13	Crooked Creek silty clay loam	1,160	0.1
14	Curecanti very cobbly loam, 2 to 8 percent slopes	12,200	1.4
15	Denver clay loam, 4 to 25 percent slopes	2,440	0.3
16	Farisita very gravelly sandy loam, 10 to 35 percent slopes	20,560	2.4
17	Fort Collins loam, 1 to 3 percent slopes	8,080	0.9
18	Fort Collins loam, 3 to 9 percent slopes	8,920	1.0
19	Fughes sandy clay loam, 3 to 15 percent slopes	2,640	0.3
20	Gelkie sandy loam, 3 to 15 percent slopes	7,220	0.8
21	Gelkie sandy loam, 15 to 30 percent slopes	2,480	0.3
22	Glenberg sandy loam	4,520	0.5
23	Goemmer cobbly clay loam, 20 to 50 percent slopes	11,680	1.3
24	Haverson clay loam	2,720	0.3
25	Holderness loam, 4 to 20 percent slopes	1,320	0.2
26	Kim fine sandy loam, 3 to 9 percent slopes	10,120	1.2
27	Kim-Cascajo complex, 1 to 12 percent slopes	3,320	0.4
28	Lakehelen-Rock outcrop complex, 15 to 80 percent slopes	12,680	1.5
29	Larkson stony loam, 5 to 20 percent slopes	1,960	0.2
30	Leadville fine sandy loam, 25 to 55 percent slopes	11,920	1.4
31	Libeg gravelly sandy loam, 15 to 45 percent slopes	9,840	1.1
32	Libeg-Coutis complex, 5 to 15 percent slopes	10,560	1.2
33	Limon silty clay loam, 0 to 2 percent slopes	5,480	0.6
34	Limon clay, 3 to 12 percent slopes	5,000	0.6
35	Loberg cobbly loam, 4 to 25 percent slopes	2,040	0.2
36	Louviers-Travessilla complex, 3 to 25 percent slopes	14,680	1.7
37	Louviers-Travessilla-Rock outcrop complex, 25 to 85 percent slopes	12,680	1.5
38	Lymanson cobbly fine sandy loam, 20 to 40 percent slopes	1,640	0.2
39	Maitland fine sandy loam, 1 to 15 percent slopes	5,400	0.6
40	Manvel silty clay loam, 1 to 5 percent slopes	7,200	0.8
41	Manvel silty clay loam, saline, 1 to 5 percent slopes	4,880	0.6
42	Manvel-Minnequa loams, 1 to 5 percent slopes	15,480	1.8
43	Manzano loam	960	0.1
44	Manzanola clay loam, 0 to 2 percent slopes	12,840	1.5
45	Manzanola clay loam, 2 to 5 percent slopes	19,880	2.3
46	Midway clay, 3 to 20 percent slopes	6,480	0.7
47	Minnequa-Otero sandy loams, 2 to 12 percent slopes	3,120	0.4
48	Montez-Rogert complex, 15 to 65 percent slopes	6,960	0.8
49	Morop loam, 2 to 18 percent slopes	13,680	1.6
50	Neville fine sandy loam, 1 to 3 percent slopes	5,720	0.7
51	Neville fine sandy loam, 3 to 9 percent slopes	10,000	1.1
52	Noden sandy loam, 1 to 8 percent slopes	13,520	1.5
53	Noden sandy loam, 8 to 15 percent slopes	15,160	1.7
54	Noden loam, 1 to 9 percent slopes	14,880	1.7
55	Noden-Bond sandy loams, 2 to 18 percent slopes	19,880	2.3
56	Noden-Bond loams, 1 to 9 percent slopes	5,800	0.7
57	Nunn loam, 0 to 3 percent slopes	7,560	0.9
58	Nunn stony loam, 2 to 5 percent slopes	1,400	0.2
59	Nunn clay loam, 3 to 9 percent slopes	2,600	0.3
60	Olney sandy loam, 3 to 12 percent slopes	17,000	1.9
61	Olney-Progresso sandy loams, 3 to 15 percent slopes	21,360	2.4
62	Otero sandy loam, 1 to 9 percent slopes	16,680	1.9
63	Otero fine sandy loam, 1 to 9 percent slopes	9,480	1.1
64	Patent loam, 2 to 8 percent slopes	6,840	0.8
65	Penrose-Minnequa complex, 2 to 15 percent slopes	11,200	1.3
66	Penrose-Rock outcrop complex, 4 to 25 percent slopes	10,640	1.2
67	Potts sandy loam, 1 to 8 percent slopes	13,720	1.6
68	Razor clay loam, 1 to 12 percent slopes	9,040	1.0
69	Razor silty clay, 2 to 20 percent slopes	9,120	1.0

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
70	Ring cobbly sandy loam, 2 to 6 percent slopes	4,240	0.5
71	Ring cobbly loam, 20 to 45 percent slopes	8,760	1.0
72	Riverwash-Las Animas complex	3,680	0.4
73	Rock outcrop	6,720	0.8
74	Rogert-Woodhall complex, 25 to 65 percent slopes	9,560	1.1
75	Rubble Land-Rock outcrop complex	6,760	0.8
76	Schamber gravelly sandy loam, 3 to 15 percent slopes	6,400	0.7
77	Schamber-Midway complex, 3 to 25 percent slopes	9,960	1.1
78	Tisworth sandy loam, 2 to 8 percent slopes	2,080	0.2
79	Tolman-Rock outcrop complex, 25 to 65 percent slopes	9,040	1.0
80	Trag loam, 3 to 12 percent slopes	4,600	0.5
81	Travessilla-Kim complex, 1 to 9 percent slopes	13,600	1.6
82	Travessilla-Rock outcrop complex, 15 to 45 percent slopes	11,960	1.4
83	Uinta-Lakehelen fine sandy loams, 4 to 25 percent slopes	5,240	0.6
84	Ustic Torriorthents-Rock outcrop complex, 5 to 40 percent slopes	22,720	2.6
85	Utica gravelly sandy loam, 2 to 10 percent slopes	3,360	0.4
86	Vona fine sandy loam, 1 to 5 percent slopes	5,280	0.6
87	Wahatoya-Rock outcrop complex, 35 to 65 percent slopes	6,080	0.7
88	Welring very channery loam, 4 to 25 percent slopes	1,240	0.1
89	Wetmore-Mortenson Association, 20 to 50 percent slopes	1,400	0.2
90	Wiley loam, 1 to 3 percent slopes	34,700	4.0
91	Wiley-Kim loams, 2 to 9 percent slopes	44,965	5.0
92	Willowman gravelly sandy loam, 3 to 8 percent slopes	15,240	1.7
93	Willowman gravelly sandy loam, 15 to 30 percent slopes	5,800	0.7
94	Woodhall-Rock outcrop complex, 5 to 20 percent slopes	3,080	0.4
	Water	1,355	0.2
	Total	873,000	100.0

TABLE 5.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
1 Apishapa	Severe: flooding, wetness, too clayey.	Severe: too clayey, excess salt.	Severe: too clayey, wetness, flooding.	Severe: too clayey.
2 Baca	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
3 Badito	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
4*: Bayerton	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Maitland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
5*: Benteen	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Rock outcrop.				
6*: Bond	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
Rock outcrop.				
7 Breece	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
8 Brownsto	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
9 Brownsto	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.
10 Castner	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope.
11 Coldcreek	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.
12 Collegiate	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.
13 Crooked Creek	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
14--- Curecanti	Moderate: small stones.	Moderate: small stones.	Severe: large stones, small stones.	Severe: large stones.
15--- Denver	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
16--- Farisita	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.
17--- Fort Collins	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
18--- Fort Collins	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
19--- Fughes	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
20--- Gelkie	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
21--- Gelkie	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
22--- Glenberg	Severe: flooding.	Slight---	Moderate: small stones.	Slight.
23--- Goemmer	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
24--- Haverson	Severe: flooding.	Slight---	Moderate: slope, small stones.	Slight.
25--- Holderness	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
26--- Kim	Slight---	Slight---	Severe: slope.	Slight.
27*: Kim---	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
Cascajo---	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
28*: Lakehelen---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.				
29--- Larkson	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
30--- Leadville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
31--Libeg	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
32*:				
Libeg	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight.
Coutis	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
33--Limon	Severe: flooding.	Moderate: excess salt.	Moderate: flooding.	Slight.
34--Limon	Moderate: too clayey, excess salt.	Moderate: too clayey, excess salt.	Severe: slope.	Moderate: too clayey.
35--Loberg	Moderate: slope, large stones, small stones.	Moderate: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Slight.
36*:				
Louviers	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Moderate: slope.
Travessilla	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Slight.
37*:				
Louviers	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.
Travessilla	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope.
Rock outcrop.				
38--Lymanson	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
39--Maitland	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
40--Manvel	Slight	Slight	Moderate: slope.	Severe: erodes easily.
41--Manvel	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Slight.
42*:				
Manvel	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.
Minnequa	Moderate: dusty.	Moderate: dusty.	Moderate: slope, depth to rock.	Moderate: dusty.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
43--- Manzano	Severe: flooding.	Slight---	Slight---	Slight.
44--- Manzanola	Slight---	Slight---	Moderate: small stones.	Slight.
45--- Manzanola	Slight---	Slight---	Moderate: small stones, slope.	Slight.
46--- Midway	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Slight.
47*: Minnequa---	Slight---	Slight---	Moderate: slope, depth to rock.	Slight.
Otero---	Slight---	Slight---	Severe: slope.	Slight.
48*: Montez---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rogert---	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, small stones.	Severe: slope.
49--- Morop	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
50--- Neville	Slight---	Slight---	Moderate: slope, small stones.	Slight.
51--- Neville	Slight---	Slight---	Severe: slope.	Slight.
52--- Noden	Slight---	Slight---	Moderate: slope.	Slight.
53--- Noden	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
54--- Noden	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
55*: Noden---	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Bond---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.
56*: Noden---	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
Bond---	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
57--Nunn	Moderate: dusty.	Moderate: dusty.	Moderate: small stones.	Moderate: dusty.
58--Nunn	Moderate: dusty.	Moderate: dusty.	Moderate: small stones, slope.	Moderate: dusty.
59--Nunn	Slight	Slight	Severe: slope.	Slight.
60--Olney	Slight	Slight	Severe: slope.	Slight.
61*:				
Olney	Slight	Slight	Severe: slope.	Slight.
Progresso	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
62, 63--Otero	Slight	Slight	Moderate: slope, small stones.	Slight.
64--Patent	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
65*:				
Penrose	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Moderate: dusty.
Minnequa	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
66*:				
Penrose	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Moderate: dusty.
Rock outcrop.				
67--Potts	Slight	Slight	Moderate: slope, small stones.	Slight.
68--Razor	Slight	Slight	Severe: slope.	Slight.
69--Razor	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
70--Ring	Moderate: large stones.	Moderate: large stones.	Severe: large stones.	Moderate: large stones.
71--Ring	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.
72*:				
Riverwash.				
Las Animas	Severe: flooding, wetness, excess salt.	Severe: wetness, excess salt.	Severe: wetness, flooding, excess salt.	Severe: wetness.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
73*. Rock outcrop				
74*: Rogert	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: large stones, slope, small stones.	Severe: slope, small stones.
Woodhall	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
75*: Rubble Land.				
Rock outcrop.				
76 Schamber	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight.
77*: Schamber	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight.
Midway	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Moderate: slope.
78 Tisworth	Severe: excess salt.	Severe: excess salt.	Severe: excess salt.	Slight.
79*: Tolman	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop.				
80 Trag	Slight	Slight	Severe: slope.	Slight.
81*: Travessilla	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Slight.
Kim	Slight	Slight	Moderate: slope, small stones.	Slight.
82*: Travessilla	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope.
Rock outcrop.				
83*: Uinta	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Lakehelen	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
84*: Ustic Torriorthents-- Rock outcrop.	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
85--- Utica	Moderate: small stones.	Moderate: small stones.	Severe: slope, small stones.	Slight.
86--- Vona	Slight---	Slight---	Moderate: slope.	Slight.
87*: Wahatoya--- Rock outcrop.	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
88--- Welring	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.
89*: Wetmore---	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.
Mortenson---	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: large stones, slope.
90--- Wiley	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.
91*: Wiley---	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.
Kim---	Moderate: dusty.	Moderate: dusty.	Severe: slope.	Moderate: dusty.
92--- Willowman	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight.
93--- Willowman	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.
94*: Woodhall--- Rock outcrop.	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
1---------- Apishapa	Poor	Poor	Good	---	Fair	Poor	Good	Poor	---	Fair	Fair.
2---------- Baca	Poor	Good	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
3---------- Badito	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	---	Poor	Very poor.	Fair.
4*: Bayerton----------	Very poor.	Very poor.	---	Fair	---	Very poor.	Very poor.	Very poor.	Fair	Very poor.	---
Maitland----------	Very poor.	Very poor.	Very poor.	Good	---	Very poor.	Very poor.	Very poor.	Good	Very poor.	Very poor.
5*: Benteen----------	Poor	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
Rock outcrop.											
6*: Bond----------	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Rock outcrop.											
7---------- Breece	Fair	Fair	Good	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
8, 9---------- Brownsto	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
10---------- Castner	Poor	Poor	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
11---------- Coldcreek	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---
12---------- Collegiate	Very poor.	Poor	Good	---	Fair	Fair	Fair	Poor	---	Fair	Fair.
13---------- Crooked Creek	Poor	Fair	Fair	---	Fair	Good	Good	Fair	---	Good	Fair.
14---------- Curecanti	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
15---------- Denver	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
16---------- Farisita	Very poor.	Very poor.	Poor	Very poor.	Fair	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
17, 18---------- Fort Collins	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
19---------- Fughes	Fair	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
20, 21---------- Gelkie	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
22---------- Glenberg	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
23---------- Goemmer	Very poor.	Very poor.	Good	Fair	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---
24---------- Haverson	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
25---------- Holderness	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
26---------- Kim	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
27*:											
Kim----------	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Cascajo----------	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
28*:											
Lakehelen---------	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.	---
Rock outcrop.											
29---------- Larkson	Poor	Fair	Good	Fair	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
30---------- Leadville	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
31---------- Libeg	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
32*:											
Libeg----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
Coutis----------	Poor	Poor	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
33, 34---------- Limon	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
35---------- Loberg	Very poor.	Poor	Good	Fair	Good	---	---	Poor	Fair	---	---
36*:											
Louviers----------	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Travessilla-------	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
37*:											
Louviers----------	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Travessilla-------	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Rock outcrop.											

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
38---------- Lymanson	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
39---------- Maitland	Poor	Very poor.	Very poor.	Good	---	Very poor.	Very poor.	Poor	Good	Very poor.	Very poor.
40---------- Manvel	Poor	Fair	Fair	Very poor.	---	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
41---------- Manvel	Poor	Poor	Poor	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Poor.
42*: Manvel----------	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Minnequa----------	Poor	Poor	Fair	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Poor.
43---------- Manzano	Fair	Good	Fair	---	Fair	Fair	Fair	Fair	---	Fair	---
44, 45---------- Manzanola	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
46---------- Midway	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
47*: Minnequa----------	Poor	Poor	Fair	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Poor.
Otero----------	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
48*: Montez----------	Very poor.	Very poor.	Good	Good	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Rogert----------	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
49---------- Morop	Fair	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
50, 51---------- Neville	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
52---------- Noden	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
53. Noden											
54---------- Noden	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
55*: Noden----------	Fair	Good	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Bond----------	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
56*: Noden----------	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
56*:											
Bond	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
57---------- Nunn	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
58---------- Nunn	Fair	Good	Good	Very poor.	---	Very poor.	Very poor.	Good	Very poor.	Very poor.	Good.
59---------- Nunn	Fair	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
60---------- Olney	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
61*:											
Olney	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Progresso	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
62, 63---------- Otero	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
64---------- Patent	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
65*:											
Penrose	Very poor.	Very poor.	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Minnequa	Poor	Poor	Fair	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Poor.
66*:											
Penrose	Very poor.	Very poor.	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Rock outcrop.											
67---------- Potts	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
68, 69---------- Razor	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
70---------- Ring	Poor	Poor	Good	Good	Good	Poor	Poor	Fair	Good	Poor	Good.
71---------- Ring	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	Good.
72*:											
Riverwash.											
Las Animas	Poor	Poor	Good	---	Fair	Good	Good	Poor	---	Good	Fair.
73*.											
Rock outcrop											
74*:											
Rogert	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
74*: Woodhall	Very poor.	Very poor.	Good	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
75*: Rubble Land.											
Rock outcrop.											
76--- Schamber	Very poor.	Very poor.	Poor	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
77*: Schamber	Very poor.	Very poor.	Poor	Very poor.	---	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.
Midway	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
78--- Tisworth	Very poor.	Very poor.	Poor	---	Poor	Poor	Very poor.	Very poor.	---	Very poor.	Poor.
79*: Tolman	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Rock outcrop.											
80--- Trag	Fair	Good	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
81*: Travessilla	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Kim	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
82*: Travessilla	Very poor.	Very poor.	Poor	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Rock outcrop.											
83*: Uinta	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Lakehelen	Poor	Poor	Poor	Very poor.	Poor	Very poor.	Very poor.	Poor	Very poor.	Very poor.	---
84*: Ustic Torriorthents	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
Rock outcrop.											
85--- Utica	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
86--- Vona	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
87*: Wahatoya	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	---

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Conif-erous plants	Shrubs	Wetland plants	Shallow water areas	Open-land wild-life	Wood-land wild-life	Wetland wild-life	Range-land wild-life
87*: Rock outcrop.											
88---------- Welring	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Poor.
89*: Wetmore----------	Very poor.	Very poor.	Poor	Poor	Good	Very poor.	Very poor.	Very poor.	Poor	Very poor.	---
Mortenson----------	Very poor.	Very poor.	Very poor.	Good	---	Very poor.	Very poor.	Very poor.	Fair	Very poor.	---
90---------- Wiley	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
91*: Wiley----------	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
Kim----------	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
92, 93---------- Willowman	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
94*: Woodhall----------	Poor	Poor	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Rock outcrop.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
1---------- Apishapa	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, flooding, shrink-swell.
2---------- Baca	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
3---------- Badito	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
4*: Bayerton----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Maitland----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.
5*: Benteen----------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.
Rock outcrop.					
6*: Bond----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Rock outcrop.					
7---------- Breece	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
8---------- Brownsto	Moderate: large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, large stones.
9---------- Brownsto	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
10---------- Castner	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
11---------- Coldcreek	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
12---------- Collegiate	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: frost action.
13---------- Crooked Creek	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, flooding, frost action.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
14---- Curecanti	Severe: cutbanks cave, large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
15---- Denver	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
16---- Farisita	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
17---- Fort Collins	Slight----	Slight----	Slight----	Slight----	Slight.
18---- Fort Collins	Slight----	Slight----	Slight----	Moderate: slope.	Slight.
19---- Fughes	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
20---- Gelkie	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.
21---- Gelkie	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
22---- Glenberg	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
23---- Goemmer	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
24---- Haverson	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
25---- Holderness	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
26---- Kim	Slight----	Slight----	Slight----	Moderate: slope.	Slight.
27*:					
Kim----	Slight----	Slight----	Slight----	Moderate: slope.	Slight.
Cascajo----	Severe: cutbanks cave.	Slight----	Slight----	Moderate: slope.	Slight.
28*:					
Lakehelen----	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
29---- Larkson	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
30---------- Leadville	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
31---------- Libeg	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
32*: Libeg----------	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.
Coutis----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
33---------- Limon	Moderate: too clayey, flooding.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, flooding, shrink-swell.
34---------- Limon	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
35---------- Loberg	Moderate: too clayey, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: slope, frost action, shrink-swell.
36*: Louviers----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Travessilla------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
37*: Louviers----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
Travessilla------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Rock outcrop.					
38---------- Lymanson	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
39---------- Maitland	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.
40, 41---------- Manvel	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
42*: Manvel----------	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.
Minnequa---------	Moderate: depth to rock.	Slight----------	Moderate: depth to rock.	Slight----------	Slight.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
43---------- Manzano	Slight----------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, shrink-swell.
44, 45---------- Manzanola	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
46---------- Midway	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
47*:					
Minnequa---------	Moderate: depth to rock.	Slight----------	Moderate: depth to rock.	Slight----------	Slight.
Otero----------	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
48*:					
Montez----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rogert----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
49---------- Morop	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
50---------- Neville	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: low strength.
51---------- Neville	Slight----------	Slight----------	Slight----------	Moderate: slope.	Moderate: low strength.
52---------- Noden	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
53---------- Noden	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate. slope.
54---------- Noden	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
55*:					
Noden----------	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
Bond----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
56*:					
Noden----------	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
Bond----------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
57, 58, 59-------- Nunn	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
60---------- Olney	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
61*: Olney----------	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Slight.
Progresso--------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, shrink-swell.
62, 63---------- Otero	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
64---------- Patent	Slight----------	Slight----------	Slight----------	Moderate: slope.	Severe: low strength.
65*: Penrose----------	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.
Minnequa---------	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.
66*: Penrose----------	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.
Rock outcrop.					
67---------- Potts	Slight----------	Slight----------	Slight----------	Moderate: slope.	Slight.
68---------- Razor	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
69---------- Razor	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.
70---------- Ring	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.
71---------- Ring	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
72*: Riverwash.					
Las Animas-------	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.
73*. Rock outcrop					

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
74*:					
Rogert	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Woodhall	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
75*:					
Rubble Land.					
Rock outcrop.					
76 Schamber	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
77*:					
Schamber	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
Midway	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.
78 Tisworth	Slight	Slight	Slight	Moderate: slope.	Slight.
79*:					
Tolman	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Rock outcrop.					
80 Trag	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.
81*:					
Travessilla	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Kim	Slight	Slight	Slight	Slight	Slight.
82*:					
Travessilla	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.
Rock outcrop.					
83*:					
Uinta	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.
Lakehelen	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
84*:					
Ustic Torriorthents	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Rock outcrop.					

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
85---------- Utica	Severe: cutbanks cave.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: large stones.
86---------- Vona	Severe: cutbanks cave.	Slight----------	Slight----------	Slight----------	Slight.
87*: Wahatoya--------- Rock outcrop.	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
88---------- Welring	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.
89*: Wetmore---------- Mortenson--------	Severe: depth to rock, slope. Severe: large stones, slope.	Severe: slope, depth to rock. Severe: slope, large stones.	Severe: depth to rock, slope. Severe: slope, large stones.	Severe: slope, depth to rock. Severe: slope, large stones.	Severe: depth to rock, slope. Severe: slope, large stones.
90---------- Wiley	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.
91*: Wiley---------- Kim----------	Slight---------- Slight----------	Moderate: shrink-swell. Moderate: shrink-swell.	Moderate: shrink-swell. Moderate: shrink-swell.	Moderate: shrink-swell. Moderate: shrink-swell, slope.	Moderate: low strength, shrink-swell. Moderate: shrink-swell.
92---------- Willowman	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: frost action, large stones.
93---------- Willowman	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
94*: Woodhall--------- Rock outcrop.	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, frost action.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1---------- Apishapa	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
2---------- Baca	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
3---------- Badito	Severe: slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
4*: Bayerton----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Maitland----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
5*: Benteen----------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Rock outcrop.					
6*: Bond----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
7---------- Breece	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage, small stones.
8---------- Brownsto	Moderate: percs slowly, slope, large stones.	Severe: seepage, slope.	Moderate: slope, large stones.	Moderate: slope.	Poor: small stones.
9---------- Brownsto	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
10---------- Castner	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
11---------- Coldcreek	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
12---------- Collegiate	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
13--Crooked Creek	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
14--Curecanti	Severe: poor filter, large stones.	Severe: seepage, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: seepage, small stones.
15--Denver	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
16--Farisita	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
17, 18--Fort Collins	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
19--Fughes	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
20--Gelkie	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
21--Gelkie	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
22--Glenberg	Moderate: flooding.	Severe: seepage, flooding.	Moderate: flooding, too sandy.	Moderate: flooding.	Fair: too sandy.
23--Goemmer	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, slope.
24--Haverson	Moderate: flooding, percs slowly.	Severe: flooding.	Severe: too sandy.	Moderate: flooding.	Poor: too sandy.
25--Holderness	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
26--Kim	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
27*: Kim	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
Cascajo	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Slight	Poor: seepage, too sandy, small stones.
28*: Lakehelen	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
28*: Rock outcrop.					
29--- Larkson	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
30--- Leadville	Severe: slope, large stones.	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: slope.	Poor: small stones, slope.
31--- Libeg	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
32*: Libeg---	Severe: large stones.	Severe: slope, large stones.	Severe: large stones.	Moderate: slope.	Poor: small stones.
Coutis---	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope.
33--- Limon	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: hard to pack.
34--- Limon	Severe: percs slowly.	Severe: slope.	Slight---	Slight---	Poor: hard to pack.
35--- Loberg	Severe: percs slowly.	Severe: slope, large stones.	Severe: too clayey, large stones.	Moderate: slope.	Poor: too clayey, large stones.
36*: Louviers---	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, hard to pack, slope.
Travessilla---	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
37*: Louviers---	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, hard to pack, slope.
Travessilla---	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
38--- Lymanson	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
39--- Maitland	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
40--Manvel	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
41--Manvel	Severe: percs slowly.	Moderate: slope.	Severe: excess salt.	Slight	Good.
42*:					
Manvel	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Minnequa	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
43--Manzano	Severe: percs slowly.	Severe: flooding.	Severe: seepage.	Moderate: flooding.	Fair: too clayey.
44--Manzanola	Severe: percs slowly.	Moderate: seepage.	Slight	Slight	Good.
45--Manzanola	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
46--Midway	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
47*:					
Minnequa	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Otero	Slight	Severe: seepage, slope.	Slight	Slight	Fair: small stones.
48*:					
Montez	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: slope.
Rogert	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
49--Morop	Severe: percs slowly.	Severe: slope.	Severe: too clayey, large stones.	Moderate: slope.	Poor: too clayey.
50, 51--Neville	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
52--Noden	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
53--Noden	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
54--Noden	Slight	Moderate: seepage, slope.	Slight	Slight	Good.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
55*:					
Noden	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Bond	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
56*:					
Noden	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Bond	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
57--- Nunn	Slight	Moderate: seepage.	Severe: seepage, too clayey.	Slight	Poor: too clayey, hard to pack.
58--- Nunn	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
59--- Nunn	Severe: percs slowly.	Moderate: slope.	Severe: seepage, too clayey.	Slight	Poor: too clayey, hard to pack.
60--- Olney	Slight	Severe: seepage, slope.	Moderate: too sandy.	Slight	Fair: too sandy.
61*:					
Olney	Slight	Severe: seepage.	Moderate: too sandy.	Slight	Fair: too sandy.
Progresso	Severe: depth to rock.	Severe: seepage, depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
62, 63--- Otero	Slight	Severe: seepage.	Slight	Slight	Fair: small stones.
64--- Patent	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
65*:					
Penrose	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Minnequa	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
66*:					
Penrose	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Rock outcrop.					
67--- Potts	Slight	Moderate: seepage, slope.	Slight	Slight	Good.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
68--- Razor	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, excess salt.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
69--- Razor	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, excess salt.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
70--- Ring	Severe: percs slowly, large stones.	Severe: large stones.	Severe: large stones.	Slight---	Poor: large stones.
71--- Ring	Severe: percs slowly, slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
72*: Riverwash.					
Las Animas---	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness.
73*. Rock outcrop					
74*: Rogert---	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
Woodhall---	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
75*: Rubble Land.					
Rock outcrop.					
76--- Schamber	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones, seepage, too sandy.
77*: Schamber---	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones, seepage, too sandy.
Midway---	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, hard to pack, slope.
78--- Tisworth	Severe: percs slowly.	Moderate: slope.	Severe: excess salt.	Slight---	Fair: small stones.
79*: Tolman---	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
79*: Rock outcrop.					
80---- Trag	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight----	Fair: too clayey, small stones.
81*: Travessilla----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Kim----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----	Slight----	Fair: small stones.
82*: Travessilla----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
83*: Uinta----	Moderate: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
Lakehelen----	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
84*: Ustic Torriorthents----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
85---- Utica	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
86---- Vona	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Slight----	Fair: too sandy.
87*: Wahatoya----	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
88---- Welring	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
89*: Wetmore----	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
89*: Mortenson	Severe: percs slowly, slope, large stones.	Severe: seepage, slope, large stones.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, hard to pack, small stones.
90 Wiley	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
91*: Wiley	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
Kim	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Fair: small stones.
92 Willowman	Moderate: large stones.	Severe: seepage.	Severe: seepage, large stones.	Severe: seepage.	Poor: small stones.
93 Willowman	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.
94*: Woodhall	Severe: depth to rock.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones.
Rock outcrop.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1---------- Apishapa	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess salt.
2---------- Baca	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
3---------- Badito	Poor: slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, slope.
4*: Bayerton----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Maitland----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
5*: Benteen----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Rock outcrop.				
6*: Bond----------	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
7---------- Breece	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
8---------- Brownsto	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
9---------- Brownsto	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
10---------- Castner	Poor: area reclaim, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
11---------- Coldcreek	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
12---------- Collegiate	Fair: wetness.	Probable----------	Probable----------	Poor: small stones, area reclaim.
13---------- Crooked Creek	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
14--Curecanti	Poor: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
15--Denver	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
16--Farisita	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
17, 18--Fort Collins	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
19--Fughes	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
20--Gelkie	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
21--Gelkie	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
22--Glenberg	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
23--Goemmer	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
24--Haverson	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
25--Holderness	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
26--Kim	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
27*:				
Kim	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Cascajo	Good	Probable	Probable	Poor: small stones, area reclaim.
28*:				
Lakehelen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Rock outcrop.				
29--Larkson	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
30--Leadville	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones, slope.
31--Libeg	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
32*:				
Libeg	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones.
Coutis	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
33--Limon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: excess salt.
34--Limon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
35--Loberg	Fair: large stones, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
36*:				
Louviers	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Travessilla	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
37*:				
Louviers	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Travessilla	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
38--Lymanson	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, large stones.
39--Maitland	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
40--Manvel	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
41--Manvel	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
42*:				
Manvel	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Minnequa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, large stones.
43---- Manzano	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
44, 45---- Manzanola	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
46---- Midway	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey.
47*:				
Minnequa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, large stones.
Otero	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
48*:				
Montez	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Rogert	Poor: area reclaim, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
49---- Morop	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
50, 51---- Neville	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
52---- Noden	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
53---- Noden	Good	Improbable: excess fines.	Improbable: excess fines.	
54---- Noden	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
55*:				
Noden	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Bond	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
56*:				
Noden	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
56*:				
Bond	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
57—Nunn	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
58—Nunn	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
59—Nunn	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
60—Olney	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
61*:				
Olney	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Progresso	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
62, 63—Otero	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
64—Patent	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: large stones.
65*:				
Penrose	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Minnequa	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, large stones.
66*:				
Penrose	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Rock outcrop.				
67—Potts	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
68—Razor	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey, small stones.
69—Razor	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
70—Ring	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
71—Ring	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
72*: Riverwash.				
Las Animas	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, wetness.
73*. Rock outcrop				
74*: Rogert	Poor: area reclaim, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
Woodhall	Poor: area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
75*: Rubble Land. Rock outcrop.				
76 Schamber	Good	Probable	Probable	Poor: small stones, area reclaim.
77*: Schamber	Good	Probable	Probable	Poor: small stones, area reclaim.
Midway	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey, slope.
78 Tisworth	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, excess salt.
79*: Tolman	Poor: area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
80 Trag	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
81*: Travessilla	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Kim	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
82*: Travessilla	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
82*: Rock outcrop.				
83*: Uinta	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Lakehelen	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
84*: Ustic Torriorthents	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Rock outcrop.				
85 Utica	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
86 Vona	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
87*: Wahatoya	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				
88 Welring	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
89*: Wetmore	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Mortenson	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim, slope.
90 Wiley	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
91*: Wiley	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
Kim	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
92 Willowman	Fair: large stones.	Probable	Probable	Poor: small stones, area reclaim.
93 Willowman	Fair: large stones, slope.	Probable	Probable	Poor: small stones, area reclaim, slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
94*: Woodhall	Poor: area reclaim.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones.
Rock outcrop.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1---------- Apishapa	Slight----------	Severe: wetness.	Percs slowly, flooding.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, excess salt, percs slowly.
2---------- Baca	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
3---------- Badito	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
4*: Bayerton----------	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Maitland----------	Severe: slope.	Moderate: piping.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
5*: Benteen----------	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
6*: Bond----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily.
Rock outcrop.						
7---------- Breece	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, too sandy.	Slope, droughty.
8---------- Brownsto	Severe: seepage, slope.	Moderate: piping, large stones.	Deep to water		Slope, large stones.	Large stones, slope, droughty.
9---------- Brownsto	Severe: seepage, slope.	Moderate: piping, large stones.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones.	Large stones, slope, droughty.
10---------- Castner	Severe: depth to rock, slope.	Severe: seepage.	Deep to water	Large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
11---------- Coldcreek	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, soil blowing.	Large stones, slope, droughty.
12---------- Collegiate	Severe: seepage.	Severe: seepage, wetness.	Large stones, frost action, cutbanks cave.	Wetness--------	Large stones, wetness, too sandy.	Wetness.
13---------- Crooked Creek	Slight----------	Severe: wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, flooding.	Wetness, percs slowly.	Wetness, percs slowly.
14---------- Curecanti	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Large stones, too sandy.	Large stones, droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
15---------- Denver	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
16---------- Farisita	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
17---------- Fort Collins	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
18---------- Fort Collins	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
19---------- Fughes	Severe: slope.	Slight---------	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
20, 21---------- Gelkie	Severe: slope.	Moderate: thin layer, large stones.	Deep to water	Soil blowing, slope.	Slope, large stones, soil blowing.	Large stones, slope.
22---------- Glenberg	Severe: seepage.	Severe: piping.	Deep to water	Droughty-------	Too sandy, soil blowing.	Droughty.
23---------- Goemmer	Severe: slope.	Moderate: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
24---------- Haverson	Moderate: seepage.	Severe: piping.	Deep to water	Excess salt----	Too sandy------	Excess salt.
25---------- Holderness	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
26---------- Kim	Moderate: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope, excess salt.	Soil blowing---	Favorable.
27*:						
Kim----------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
Cascajo----------	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Too sandy------	Droughty.
28*:						
Lakehelen--------	Severe: slope.	Moderate: seepage, piping, large stones.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
29---------- Larkson	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
30---------- Leadville	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, soil blowing.	Large stones, slope, droughty.
31---------- Libeg	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, soil blowing.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
32*:						
Libeg	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, soil blowing.	Large stones, slope, droughty.
Coutis	Severe: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
33--- Limon	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Excess salt, percs slowly.
34--- Limon	Moderate: slope.	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly, slope.	Percs slowly	Excess salt, percs slowly.
35--- Loberg	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones.	Slope, large stones.
36*:						
Louviers	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock.	Slope, erodes easily.
Travessilla	Severe: depth to rock.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
37*:						
Louviers	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock.	Slope, erodes easily.
Travessilla	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.						
38--- Lymanson	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
39--- Maitland	Severe: slope.	Moderate: piping.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
40--- Manvel	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
41--- Manvel	Moderate: slope.	Severe: piping, excess salt.	Deep to water	Slope, excess salt.	Erodes easily	Excess salt, erodes easily.
42*:						
Manvel	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
Minnequa	Moderate: seepage, depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
43--- Manzano	Slight	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
44---------- Manzanola	Moderate: seepage.	Moderate: thin layer.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
45---------- Manzanola	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
46---------- Midway	Severe: depth to rock, slope.	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
47*: Minnequa----------	Moderate: seepage, depth to rock, slope.	Severe: piping.	Deep to water	Soil blowing, depth to rock, slope.	Depth to rock, soil blowing.	Depth to rock.
Otero----------	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing---	Droughty.
48*: Montez----------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing, slope.	Slope, too sandy, soil blowing.	Slope, droughty.
Rogert----------	Severe: depth to rock, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
49---------- Morop	Severe: slope.	Moderate: thin layer, large stones.	Deep to water	Percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, percs slowly.
50---------- Neville	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
51---------- Neville	Moderate: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing---	Favorable.
52---------- Noden	Moderate: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing---	Favorable.
53---------- Noden	Severe: slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
54---------- Noden	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
55*: Noden----------	Severe: slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
Bond----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily.
56*: Noden----------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
Bond----------	Severe: depth to rock.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Depth to rock, erodes easily.	Depth to rock.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
57---------- Nunn	Slight----------	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
58---------- Nunn	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
59---------- Nunn	Moderate: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.
60---------- Olney	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing, slope.	Soil blowing---	Droughty.
61*: Olney----------	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing, slope.	Soil blowing---	Droughty.
Progresso--------	Severe: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, depth to rock, slope.	Slope, depth to rock, soil blowing.	Slope, depth to rock.
62, 63---------- Otero	Severe: seepage.	Severe: piping.	Deep to water	Droughty, soil blowing.	Soil blowing---	Droughty.
64---------- Patent	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
65*: Penrose----------	Severe: depth to rock.	Severe: piping.	Deep to water	Depth to rock, slope.	Large stones, depth to rock.	Large stones, depth to rock.
Minnequa---------	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
66*: Penrose----------	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Rock outcrop.						
67---------- Potts	Moderate: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Erodes easily, soil blowing.	Erodes easily.
68---------- Razor	Moderate: depth to rock, slope.	Severe: excess salt.	Deep to water	Percs slowly, depth to rock.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
69---------- Razor	Severe: slope.	Severe: excess salt.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
70---------- Ring	Moderate: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Large stones---	Large stones, droughty.
71---------- Ring	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
72*: Riverwash.						
Las Animas	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, droughty.	Wetness, too sandy, soil blowing.	Wetness, excess salt, droughty.
73*. Rock outcrop						
74*: Rogert	Severe: depth to rock, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Woodhall	Severe: slope.	Severe: piping, large stones.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
75*: Rubble Land.						
Rock outcrop.						
76 Schamber	Severe: slope, seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Slope, too sandy.	Slope, droughty.
77*: Schamber	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Too sandy	Droughty.
Midway	Severe: depth to rock, slope.	Moderate: hard to pack.	Deep to water	Slow intake, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
78 Tisworth	Moderate: slope.	Severe: excess salt.	Deep to water	Droughty, soil blowing, percs slowly.	Erodes easily, soil blowing.	Excess salt, erodes easily.
79*: Tolman	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
80 Trag	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
81*: Travessilla	Severe: depth to rock.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
Kim	Moderate: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope, excess salt.	Soil blowing	Favorable.
82*: Travessilla	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.						

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
83*:						
Uinta	Severe: slope.	Moderate: thin layer.	Deep to water	Droughty, soil blowing, slope.	Slope, large stones, soil blowing.	Slope, droughty.
Lakehelen	Severe: slope.	Moderate: seepage, piping, large stones.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
84*:						
Ustic Torriorthents	Severe: slope.	Severe: slope.	Deep to water	Slope	Slope	Slope.
Rock outcrop.						
85--- Utica	Severe: seepage.	Severe: seepage.	Deep to water	Large stones, droughty, slope.	Large stones, too sandy.	Large stones, droughty.
86--- Vona	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing, slope.	Too sandy, soil blowing.	Favorable.
87*:						
Wahatoya	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
88--- Welring	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
89*:						
Wetmore	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Mortenson	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, percs slowly.	Large stones, slope, droughty.
90--- Wiley	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
91*:						
Wiley	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Kim	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, excess salt.	Favorable	Favorable.
92--- Willowman	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, soil blowing.	Large stones, soil blowing.	Large stones, droughty.
93--- Willowman	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, soil blowing.	Slope, large stones, soil blowing.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
94*:						
Woodhall	Severe: slope.	Severe: piping, large stones.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Rock outcrop.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1----------	0-6	Silty clay-------	CL, CH	A-7	0	95-100	95-100	90-100	75-95	40-60	20-35
Apishapa	6-60	Clay, silty clay, clay loam.	CL, CH	A-7	0	95-100	95-100	90-100	75-95	40-60	20-35
2----------	0-3	Loam----------	CL-ML	A-4	0	100	100	85-95	70-90	20-30	5-10
Baca	3-30	Silty clay loam, clay loam, clay.	CL	A-7, A-6	0	100	100	90-100	75-95	35-50	15-30
	30-60	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	85-95	70-90	25-40	5-15
3----------	0-7	Very cobbly sandy loam.	SM	A-1, A-2	25-55	65-75	65-75	40-50	20-30	15-20	NP-5
Badito	7-16	Very gravelly sandy clay loam, very cobbly clay loam, very cobbly loam.	GC, GM-GC, SC, SM-SC	A-2	20-40	45-65	40-60	15-45	10-25	20-35	5-15
	16-35	Very gravelly sandy loam.	GP-GM, GM, GM-GC	A-1, A-2	0-10	40-55	15-50	10-35	5-20	15-25	NP-10
	35-43	Weathered bedrock	---	---	---	---	---	---	---	---	---
	43-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
4*:											
Bayerton--------	0-6	Cobbly sandy loam	SM	A-2	10-15	75-95	70-90	50-70	20-35	---	NP
	6-32	Sandy clay loam, gravelly sandy clay loam.	SC, GC	A-6, A-2	0-5	50-100	50-100	35-85	25-50	30-40	10-15
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Maitland--------	0-14	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	95-100	85-100	40-60	<25	NP-5
	14-45	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	100	100	85-100	45-80	30-45	10-25
	45-60	Loam, fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	95-100	90-100	80-100	45-80	25-40	5-20
5*:											
Benteen---------	0-6	Loam----------	ML, CL-ML	A-4	0-5	90-100	90-95	85-95	60-75	20-30	NP-10
	6-24	Clay loam, gravelly clay loam, gravelly silty clay loam.	CL, CL-ML	A-6, A-4	5-15	75-100	70-95	60-85	55-80	25-35	5-15
	24-30	Gravelly loam, gravelly clay loam, very gravelly loam.	GM-GC, SC, CL, SM-SC	A-4, A-6, A-2	10-15	60-85	50-75	35-65	30-55	20-35	5-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
6*:											
Bond----------	0-4	Sandy loam-------	SM	A-2, A-4	0-15	100	95-100	60-75	30-50	15-25	NP-5
	4-17	Sandy clay loam, gravelly sandy clay loam.	SC	A-2, A-6	0-15	80-100	70-100	60-75	30-50	20-35	10-20
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
7---------- Breece	0-33	Sandy loam-------	SM, ML	A-4, A-2	0-5	75-100	75-90	45-75	25-60	15-30	NP-5
	33-60	Gravelly coarse sandy loam, gravelly sandy loam.	SM, GM	A-1, A-2	0-5	60-100	50-75	30-50	15-35	---	NP
8---------- Brownsto	0-19	Very gravelly loam.	GM	A-1	0-15	45-60	35-50	25-35	10-20	---	NP
	19-60	Very gravelly sandy loam, very gravelly sandy clay loam.	GM	A-1, A-2	0-15	45-60	35-50	25-40	20-30	25-35	NP-5
9---------- Brownsto	0-4	Very channery loam.	GM	A-1	0-15	45-60	35-50	25-35	10-20	---	NP
	4-60	Very gravelly sandy loam, very gravelly sandy clay loam.	GM	A-1, A-2	0-15	45-60	35-50	25-40	20-30	25-35	NP-5
10---------- Castner	0-3	Very channery loam.	ML, CL-ML, SM, GM	A-4	0-15	60-90	50-80	40-70	35-60	20-30	NP-10
	3-11	Very channery loam, very cobbly loam, very channery sandy loam.	GM, GM-GC	A-2, A-1, A-4	10-30	30-65	20-55	15-45	10-40	20-30	NP-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
11---------- Coldcreek	0-14	Cobbly sandy loam	SM	A-4, A-2	15-30	80-90	70-90	50-70	25-45	20-25	NP-5
	14-37	Very gravelly loam, very cobbly sandy loam.	GM-GC, GM, SM	A-2, A-4, A-1	15-30	45-70	35-60	25-50	20-40	20-30	NP-10
	37-50	Very gravelly clay loam, very gravelly loam, very cobbly loam.	GC, GM-GC	A-2, A-4, A-6	15-40	20-65	15-60	10-50	10-45	20-35	5-15
	50	Weathered bedrock	---	---	---	---	---	---	---	---	---
12---------- Collegiate	0-14	Loam----------	ML, SM	A-4	0-5	75-100	75-95	65-90	45-70	20-30	NP-5
	14-31	Loam----------	ML, SM	A-4	0-10	75-95	75-90	65-85	45-70	20-30	NP-5
	31-60	Very gravelly sand.	GP, SP, GP-GM, SP-SM	A-1	5-30	20-60	20-50	10-35	0-10	---	NP
13---------- Crooked Creek	0-7	Silty clay loam	CH	A-7	0	95-100	95-100	90-100	80-90	50-65	25-35
	7-45	Clay, silty clay	CH	A-7	0	95-100	95-100	90-100	75-95	50-65	25-35
	45-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	85-100	80-100	75-95	60-85	35-50	15-25
14---------- Curecanti	0-15	Very cobbly loam	SM-SC, CL-ML	A-4	50-60	75-95	60-85	55-75	45-55	20-30	5-10
	15-29	Very cobbly sandy clay loam, very gravelly clay loam.	SM-SC, SC, GM-GC, GC	A-2, A-4, A-6	30-70	40-75	35-70	30-60	15-45	15-30	5-15
	29-60	Very cobbly sandy loam, very cobbly loamy sand.	SM, GM, GP-GM, SP-SM	A-2, A-1	30-70	25-60	25-60	15-50	5-30	15-25	NP-5
15---------- Denver	0-8	Clay loam--------	CL	A-6, A-7	0-5	95-100	90-100	75-100	70-90	30-50	10-25
	8-60	Silty clay, clay	CH, CL	A-7	0-5	95-100	95-100	90-100	85-100	40-75	20-45

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
16---------- Farisita	0-4	Very gravelly sandy loam.	GM	A-1	0-15	45-55	40-50	25-40	10-25	---	NP
	4-12	Coarse sandy loam, gravelly sandy loam, sandy loam.	SM	A-1, A-2, A-4	0-10	65-90	60-90	35-65	20-40	---	NP
	12-24	Weathered bedrock	---	---	---	---	---	---	---	---	---
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
17, 18---------- Fort Collins	0-4	Loam----------	ML, CL-ML	A-4	0	95-100	90-100	85-100	50-65	25-35	5-10
	4-23	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	60-75	25-40	10-20
	23-60	Loam----------	CL-ML	A-4	0	95-100	90-100	80-95	50-75	20-30	5-10
19---------- Fughes	0-5	Sandy clay loam	SC	A-6	0-5	90-100	80-100	65-80	35-50	25-35	10-20
	5-38	Clay, clay loam	CL	A-7, A-6	0-5	90-100	80-100	75-100	60-95	35-50	15-30
	38-60	Clay loam--------	CL	A-6, A-7	0-5	90-100	80-100	75-100	60-80	25-45	10-30
20---------- Gelkie	0-5	Sandy loam-------	SM, ML, SM-SC, CL-ML	A-2, A-4	0-15	75-95	75-90	50-65	25-55	20-30	NP-10
	5-22	Gravelly sandy clay loam, cobbly sandy clay loam, sandy clay loam.	GC, SC	A-2	0-25	50-85	50-80	30-60	15-35	25-35	10-15
	22-60	Very gravelly sandy loam, gravelly sandy loam, sandy loam.	SM, GM, SM-SC, GM-GC	A-1, A-2	0-35	40-85	40-80	25-50	10-30	<25	NP-10
21---------- Gelkie	0-7	Sandy loam-------	SM, ML, SM-SC, CL-ML	A-2, A-4	0-15	75-95	75-90	50-65	25-55	20-30	NP-10
	7-18	Gravelly sandy clay loam, cobbly sandy clay loam, sandy clay loam.	GC, SC	A-2	0-25	50-85	50-80	30-60	15-35	25-35	10-15
	18-60	Very gravelly sandy loam, gravelly sandy loam, sandy loam.	SM, GM, SM-SC, GM-GC	A-1, A-2	0-35	40-85	40-80	25-50	10-30	<25	NP-10
22---------- Glenberg	0-8	Sandy loam-------	SM	A-4, A-2	0	95-100	85-100	60-100	30-45	---	NP
	8-60	Stratified loamy sand to clay loam.	SM	A-2, A-4	0	90-100	75-100	50-100	25-40	---	NP
23---------- Goemmer	0-4	Cobbly clay loam	CL	A-6	15-40	85-90	75-85	65-80	55-70	30-40	10-15
	4-21	Clay loam, silty clay loam, clay.	CL	A-7	0	95-100	90-100	80-90	70-80	40-50	15-30
	21-32	Clay loam--------	CL	A-6	0	95-100	90-100	80-100	60-80	30-40	10-20
	32	Weathered bedrock	---	---	---	---	---	---	---	---	---
24---------- Haverson	0-8	Clay loam--------	CL-ML, CL	A-4, A-6	0	95-100	80-100	75-95	60-80	20-40	5-15
	8-60	Stratified clay loam to sand.	ML	A-4	0	95-100	75-100	75-90	50-60	20-35	NP-10
25---------- Holderness	0-8	Loam----------	ML	A-4	0-5	95-100	95-100	70-95	50-80	20-35	NP-10
	8-51	Clay loam, clay	CL, CH	A-6, A-7	0-5	95-100	95-100	80-95	60-85	35-60	15-35
	51	Weathered bedrock	---	---	---	---	---	---	---	---	---
26---------- Kim	0-6	Fine sandy loam	SM, ML	A-4	0-5	80-100	75-100	60-90	35-55	---	NP
	6-60	Loam, clay loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	80-100	75-100	70-95	35-85	25-40	5-15

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
27*:											
Kim	0-9	Loam	ML	A-4	0-5	75-100	75-100	60-90	50-75	20-30	NP-5
	9-60	Loam, clay loam	CL-ML, CL	A-4, A-6	0-5	75-100	75-100	65-95	50-80	25-40	5-15
Cascajo	0-5	Gravelly sandy loam.	GM, SM	A-1, A-2, A-4	0-10	50-75	50-75	30-50	10-40	---	NP
	5-20	Very gravelly sandy loam, very gravelly loamy sand, very gravelly sand.	GP-GM, GP, GM	A-1	0-15	15-50	15-50	5-30	0-20	---	NP
	20-60	Very gravelly loamy sand, very gravelly sand, gravelly sand.	GP, SP, GP-GM, SP-SM	A-1	0-15	10-60	10-60	5-30	0-10	---	NP
28*:											
Lakehelen	0-12	Fine sandy loam	SM	A-4	0-5	90-100	90-100	70-85	40-50	---	NP
	12-28	Very gravelly sandy clay loam, very cobbly sandy clay loam, extremely cobbly sandy clay loam.	GM, SM	A-2	25-60	60-80	50-70	45-55	25-35	30-40	5-10
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
29	0-8	Stony loam	ML, SM	A-4	1-5	80-90	75-85	65-80	45-65	25-30	NP-5
Larkson	8-60	Clay loam, clay	CH, CL	A-7	0-5	90-100	80-100	75-95	60-80	40-55	25-35
30	0-10	Fine sandy loam	SM, ML	A-4	0-5	75-100	75-100	60-80	35-55	20-35	NP-5
Leadville	10-39	Very stony clay loam, very stony loam, very cobbly sandy clay loam.	GC, SC	A-2, A-6	35-70	30-80	25-70	25-50	20-45	30-40	10-20
	39-60	Very stony loam, very cobbly loam, extremely stony sandy loam.	GM, SM	A-2, A-1	45-75	25-70	25-60	20-50	15-35	20-35	NP-10
31	0-14	Gravelly sandy loam.	SM	A-2, A-4, A-1	0-10	65-85	55-75	40-60	20-40	20-30	NP-5
Libeg	14-60	Very channery sandy clay loam, very channery clay loam, very cobbly clay loam.	GM-GC, GC, SM-SC, SC	A-2, A-4, A-6	30-65	40-80	30-70	20-55	15-50	25-35	5-15
32*:											
Libeg	0-14	Gravelly sandy loam.	SM	A-2, A-4, A-1	0-10	65-85	55-75	40-60	20-40	20-30	NP-5
	14-60	Very channery sandy clay loam, very channery clay loam, very cobbly clay loam.	GM-GC, GC, SM-SC, SC	A-2, A-4, A-6	30-65	40-80	30-70	20-55	15-50	25-35	5-15
Coutis	0-32	Sandy loam	SM	A-4	0	75-100	75-100	60-85	40-50	---	NP
	32-50	Fine sandy loam, sandy loam.	SM	A-4	0	75-100	75-100	60-85	40-50	---	NP
	50-60	Very gravelly sandy loam.	GM, SM	A-1, A-2	0-10	50-75	50-75	35-55	20-35	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
33---------- Limon	0-2	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	60-90	30-45	15-30
	2-60	Silty clay, clay, silty clay loam.	CH, CL	A-7	0	100	95-100	95-100	75-95	40-60	20-40
34---------- Limon	0-2	Clay----------	CL, CH	A-6, A-7	0	100	100	95-100	75-95	30-60	15-40
	2-60	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	100	100	95-100	65-95	40-60	20-40
35---------- Loberg	0-19	Cobbly loam------	SM-SC, SC, CL, CL-ML	A-4, A-2	15-30	75-85	70-85	50-65	35-60	25-35	5-15
	19-52	Very stony clay, very cobbly clay loam, very stony sandy clay.	GC, SC, CL	A-6, A-7, A-2	40-55	55-85	50-80	35-70	30-65	35-50	15-30
	52-60	Very stony clay, very channery clay loam, very stony sandy clay.	GC	A-2, A-6, A-7	25-45	45-70	40-65	30-50	25-45	35-45	15-25
36*:											
Louviers---------	0-3	Very channery clay loam.	GC	A-6, A-2	0-5	35-50	35-50	30-45	25-40	30-40	10-20
	3-16	Clay, silty clay, silty clay loam.	CL	A-7, A-6	0-15	90-100	80-100	80-100	75-95	35-50	15-30
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Travessilla------	0-15	Channery sandy loam.	GM, SM	A-1, A-2, A-4	0-5	55-80	50-75	35-60	20-45	15-20	NP-5
	15	Loam, channery loam, stony loam.	GM, SM, ML	A-4	0-20	60-90	55-85	50-75	35-55	20-30	NP-5
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
37*:											
Louviers---------	0-3	Very channery clay loam.	GC	A-6, A-2	0-5	35-50	35-50	30-45	25-40	30-40	10-20
	3-16	Clay, silty clay, silty clay loam.	CL	A-7, A-6	0-15	90-100	80-100	80-100	75-95	35-50	15-30
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Travessilla------	0-15	Channery sandy loam.	GM, SM	A-1, A-2, A-4	0-5	55-80	50-75	35-60	20-45	15-20	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
38---------- Lymanson	0-3	Cobbly fine sandy loam.	ML, CL-ML	A-4	30-40	90-100	90-100	75-95	55-70	20-30	5-10
	3-29	Cobbly clay loam, cobbly loam, gravelly sandy clay loam.	SC	A-6	10-30	70-95	65-90	50-70	35-50	35-40	15-20
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
39---------- Maitland	0-10	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	95-100	85-100	40-60	<25	NP-5
	10-45	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	100	100	85-100	45-80	30-45	10-25
	45-60	Loam, fine sandy loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	95-100	90-100	80-100	45-80	25-40	5-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
40----------	0-5	Silty clay loam	CL, CL-ML	A-6, A-4	0	95-100	95-100	95-100	80-90	25-40	5-20
Manvel	5-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	95-100	80-90	20-40	5-20
41----------	0-3	Silty clay loam	CL	A-6	0	95-100	95-100	85-100	65-90	25-40	10-20
Manvel	3-60	Silty clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	95-100	95-100	80-95	20-35	5-20
42*:											
Manvel----------	0-3	Loam----------	CL-ML, CL	A-4, A-6	0	95-100	95-100	95-100	70-90	25-35	5-15
	3-60	Silt loam, silty clay loam, loam.	CL, CL-ML	A-6, A-4	0	95-100	95-100	95-100	80-90	20-40	5-20
Minnequa--------	0-6	Loam----------	ML, CL-ML	A-4	0-1	95-100	95-100	80-100	65-90	20-30	NP-10
	6-33	Silt loam, loam, silty clay loam.	ML, CL-ML	A-4	0-5	95-100	95-100	90-100	80-90	20-30	NP-10
	33	Weathered bedrock	---	---	---	---	---	---	---	---	---
43----------	0-8	Loam----------	CL-ML	A-4	0	90-100	90-100	85-100	60-80	20-30	5-10
Manzano	8-37	Loam, clay loam	CL-ML, CL	A-4, A-6	0	80-100	75-100	70-100	50-85	25-40	5-15
	37-60	Fine sandy loam	ML, SM	A-4	0	80-100	75-100	70-100	40-60	---	NP
44----------	0-4	Clay loam--------	CL, CL-ML	A-4, A-6	0-5	95-100	80-95	70-95	50-75	25-40	5-20
Manzanola	4-30	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	65-90	35-50	20-30
	30-60	Clay loam, silty clay loam.	CL	A-6	0-5	95-100	90-100	80-95	60-90	30-40	10-20
45----------	0-3	Clay loam--------	CL, CL-ML	A-4, A-6	0-5	95-100	80-95	70-95	50-75	25-40	5-20
Manzanola	3-32	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	65-90	35-50	20-30
	32-60	Clay loam, silty clay loam.	CL	A-6	0-5	95-100	90-100	80-95	60-90	30-40	10-20
46----------	0-4	Clay----------	CL	A-6, A-7	0	75-100	75-100	70-100	70-95	35-50	20-30
Midway	4-14	Clay, clay loam, silty clay loam.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	70-95	35-60	20-35
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
47*:											
Minnequa--------	0-10	Sandy loam--------	SM	A-4	0-5	95-100	95-100	65-75	40-50	---	NP
	10-33	Silt loam, loam, silty clay loam.	ML, CL-ML	A-4	0-5	95-100	95-100	90-100	80-90	20-30	NP-10
	33	Weathered bedrock	---	---	---	---	---	---	---	---	---
Otero----------	0-6	Sandy loam--------	SM	A-2	0-1	95-100	75-100	50-80	10-35	20-25	NP-5
	6-60	Sandy loam, fine sandy loam.	SM	A-2, A-1	0-1	90-100	75-100	40-80	20-35	15-25	NP-5
48*:											
Montez----------	0-7	Sandy loam--------	SM	A-2, A-4	0-5	95-100	85-100	50-70	25-40	---	NP
	7-28	Loamy sand, sandy loam.	SM	A-2	0-5	95-100	85-100	50-75	10-35	---	NP
	28-41	Gravelly sandy clay loam.	SC, GC	A-2, A-6	0-5	55-80	50-75	40-70	20-40	25-35	10-15
	41-50	Very gravelly loamy sand, gravelly loamy sand.	GP-GM, GM, SP-SM, SM	A-1	0-5	40-75	25-60	10-45	5-20	---	NP
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rogert----------	0-7	Gravelly sandy loam.	GM, SM	A-4, A-2, A-1	5-20	60-75	55-70	35-50	20-40	25-35	NP-5
	7-14	Very gravelly sandy loam, very cobbly sandy loam.	GM, GP-GM	A-1	10-50	20-50	20-50	15-35	5-20	---	NP
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
49----------	0-7	Loam----------	ML	A-4	0-5	95-100	90-100	75-95	55-75	20-35	NP-5
Morop	7-30	Clay, clay loam	CL	A-7, A-6	0-5	90-100	90-100	80-100	70-85	35-50	15-30
	30-40	Very stony clay, very stony clay loam.	CL	A-6, A-7	40-65	75-100	75-100	65-95	60-80	30-45	10-25
	40-60	Very stony clay loam, very stony loam.	CL-ML	A-4	50-70	75-100	75-100	60-95	50-90	25-35	5-10
50, 51----------	0-5	Fine sandy loam	SM, ML	A-4, A-2	0-5	90-100	75-100	60-95	30-55	---	NP
Neville	5-60	Loam, clay loam, sandy clay loam.	CL-ML, CL	A-4, A-6	0-5	90-100	85-100	85-95	60-80	20-40	5-15
52, 53----------	0-10	Sandy loam-------	SM	A-2	0	95-100	90-100	70-95	25-35	15-25	NP-5
Noden	10-30	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	90-100	80-100	45-75	30-40	10-20
	30-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	95-100	90-100	60-70	30-50	15-25	NP-5
54----------	0-7	Loam----------	CL-ML	A-4	0	95-100	90-100	80-90	60-75	20-30	5-10
Noden	7-32	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	90-100	80-100	45-75	30-40	10-20
	32-60	Loam----------	ML, SM	A-4	0	85-100	80-100	60-80	45-65	20-25	NP-5
55*:											
Noden----------	0-10	Sandy loam-------	SM	A-2	0	95-100	90-100	70-95	25-35	15-25	NP-5
	10-30	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	90-100	80-100	45-75	30-40	10-20
	30-60	Sandy loam, fine sandy loam.	SM	A-2, A-4	0	95-100	90-100	60-70	30-50	15-25	NP-5
Bond----------	0-4	Sandy loam-------	SM	A-2, A-4	0-15	100	95-100	60-75	30-50	15-25	NP-5
	4-17	Sandy clay loam, gravelly sandy clay loam.	SC	A-2, A-6	0-15	80-100	70-100	60-75	30-50	20-35	10-20
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
56*:											
Noden----------	0-7	Loam----------	CL-ML	A-4	0	95-100	90-100	80-90	60-75	20-30	5-10
	7-32	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	95-100	90-100	80-100	45-75	30-40	10-20
	32-60	Loam----------	ML, SM	A-4	0	85-100	80-100	60-80	45-65	20-25	NP-5
Bond----------	0-3	Loam----------	ML	A-4	0-15	100	100	85-95	60-75	20-25	NP-5
	3-16	Sandy clay loam, gravelly sandy clay loam.	SC	A-2, A-6	0-15	80-100	70-100	60-75	30-50	20-35	10-20
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
57----------	0-4	Loam----------	CL, SC, SM-SC, CL-ML	A-6, A-4	0-5	95-100	80-95	70-95	45-75	20-40	5-20
Nunn	4-16	Clay loam, clay	CL, CH	A-6, A-7	0-5	95-100	90-100	85-95	65-75	35-60	20-35
	16-60	Sandy clay loam, fine sandy loam, sandy loam.	SM-SC, SM	A-2, A-4	0-5	80-100	75-100	50-80	25-50	15-25	NP-10
58----------	0-8	Stony loam-------	ML, SM	A-4	5-10	95-100	80-95	70-95	40-65	30-40	5-10
Nunn	8-42	Clay loam, clay	CL, CH	A-6, A-7	0-5	95-100	90-100	85-95	65-75	35-60	20-35
	42-60	Clay loam, loam, gravelly sandy loam.	CL, SC	A-4, A-6, A-7	0-5	80-100	80-100	60-90	35-75	30-45	5-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
59---------- Nunn	0-5	Clay loam--------	CL, SC, SM-SC, CL-ML	A-6, A-4	0-5	95-100	80-95	70-95	45-75	20-40	5-20
	5-33	Clay loam, clay	CL, CH	A-6, A-7	0-5	95-100	90-100	85-95	65-75	35-60	20-35
	33-60	Clay loam, loam, gravelly sandy clay loam.	CL, CL-ML, SM-SC, SC	A-4, A-6	0-5	80-100	60-100	60-90	35-75	15-40	5-20
60---------- Olney	0-3	Sandy loam--------	SM	A-2	0	95-100	90-100	70-95	20-35	15-25	NP-5
	3-13	Sandy clay loam, sandy loam.	SC, CL	A-6	0	95-100	90-100	80-100	40-55	20-40	10-20
	13-18	Sandy loam, sandy clay loam, fine sandy loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0	95-100	95-100	75-95	35-55	20-35	5-15
	18-60	Fine sandy loam, loamy fine sand, sandy loam.	SM	A-2	0	95-100	95-100	70-95	20-35	---	NP
61*:											
Olney----------	0-4	Sandy loam--------	SM	A-2	0	95-100	90-100	70-95	20-35	15-25	NP-5
	4-26	Sandy clay loam, sandy loam.	SC, CL	A-6	0	95-100	90-100	80-100	40-55	20-40	10-20
	26-60	Sandy loam, sandy clay loam, fine sandy loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0	95-100	95-100	75-95	35-55	20-35	5-15
Progresso--------	0-5	Sandy loam--------	SM	A-4, A-2	0	100	100	60-85	30-50	25-30	NP-5
	5-15	Sandy clay loam, clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	100	100	80-90	40-70	25-35	5-15
	15-24	Sandy loam--------	SM	A-4, A-2	0	100	100	60-70	30-40	25-30	NP-5
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
62---------- Otero	0-7	Sandy loam--------	SM	A-2	0-1	95-100	75-100	50-80	10-35	20-25	NP-5
	7-60	Sandy loam, fine sandy loam.	SM	A-2, A-1	0-1	90-100	75-100	40-80	20-35	15-25	NP-5
63---------- Otero	0-6	Fine sandy loam	SM	A-2	0-1	95-100	75-100	50-80	10-35	20-25	NP-5
	6-60	Sandy loam, fine sandy loam.	SM	A-2, A-1	0-1	90-100	75-100	40-80	20-35	15-25	NP-5
64---------- Patent	0-2	Loam----------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	85-100	65-95	20-35	5-15
	2-60	Loam, clay loam, very fine sandy loam.	CL, CL-ML	A-6, A-7, A-4	0-5	85-100	75-100	70-100	65-95	20-45	5-25
65*:											
Penrose----------	0-14	Channery loam----	ML, CL-ML, GM	A-4	5-20	60-75	60-75	50-75	40-60	15-25	NP-5
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Minnequa--------	0-6	Loam----------	ML, CL-ML	A-4	0-1	95-100	95-100	80-100	65-90	20-30	NP-10
	6-33	Silt loam, loam, silty clay loam.	ML, CL-ML	A-4	0-5	95-100	95-100	90-100	80-90	20-30	NP-10
	33	Weathered bedrock	---	---	---	---	---	---	---	---	---
66*:											
Penrose----------	0-15	Channery loam----	ML, CL-ML, GM	A-4	5-20	60-75	60-75	50-75	40-60	15-25	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
67---------- Potts	0-5	Sandy loam--------	SM	A-2, A-4	0	75-100	75-100	60-70	30-40	---	NP
	5-27	Clay loam, loam	CL	A-6	0	75-100	75-100	70-100	55-80	25-35	10-15
	27-35	Loam----------	ML	A-4	0	75-100	75-100	65-90	50-70	25-35	NP-5
	35-60	Sandy loam--------	SM	A-4	0	75-100	75-100	60-70	35-45	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
68----------	0-3	Clay loam--------	CL	A-6, A-7	0-5	90-100	90-100	80-100	75-95	35-50	15-30
Razor	3-23	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-100	40-60	20-35
	23-32	Silty clay, silty clay loam, clay.	CL, CH	A-6, A-7	0	90-100	90-100	80-100	75-100	35-60	15-35
	32	Weathered bedrock	---	---	---	---	---	---	---	---	---
69----------	0-7	Silty clay-------	CL, CH	A-7	0-5	95-100	95-100	85-100	80-100	40-60	20-35
Razor	7-20	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-100	40-60	20-35
	20-35	Silty clay, silty clay loam, clay.	CL, CH	A-6, A-7	0	90-100	90-100	80-100	75-100	35-60	15-35
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---
70----------	0-10	Cobbly sandy loam	SM	A-2, A-4	10-40	95-100	90-100	55-75	30-45	20-25	NP-5
Ring	10-19	Cobbly sandy clay, stony sandy clay, cobbly clay loam.	SC, CL	A-7, A-6	25-40	95-100	90-95	75-90	40-55	35-50	15-25
	19-37	Very cobbly sandy clay, very stony sandy clay.	SC, CL	A-7, A-6	45-70	90-95	85-90	70-85	40-55	35-50	15-25
	37-60	Very cobbly sandy clay loam, very stony sandy clay loam.	SC	A-6, A-2	50-70	90-95	85-90	70-80	30-50	30-40	10-15
71----------	0-5	Cobbly loam------	ML, CL, CL-ML	A-4	10-40	95-100	95-100	80-95	55-75	20-30	NP-10
Ring	5-15	Cobbly sandy clay, stony sandy clay, cobbly clay loam.	SC, CL	A-7, A-6	25-40	95-100	90-95	75-90	40-55	35-50	15-25
	15-40	Very cobbly sandy clay, very stony sandy clay.	SC, CL	A-7, A-6	45-70	90-95	85-90	70-85	40-55	35-50	15-25
	40-60	Very cobbly sandy clay loam, very stony sandy clay loam.	SC	A-6, A-2	50-70	90-95	85-90	70-80	30-50	30-40	10-15
72*:											
Riverwash.											
Las Animas------	0-6	Sandy loam-------	SM	A-2, A-4	0	95-100	90-100	60-75	30-50	---	NP
	6-60	Stratified loamy sand to loam.	SM	A-2, A-4	0	90-100	75-100	50-70	25-40	---	NP
73*.											
Rock outcrop											
74*:											
Rogert----------	0-6	Very cobbly loam	GP-GM, GM, SP-SM, SM	A-1, A-2	30-45	15-70	15-70	10-50	5-30	20-30	NP-5
	6-16	Very gravelly sandy loam, very cobbly sandy loam.	GM, GP-GM	A-1	10-50	20-50	20-50	15-35	5-20	---	NP
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
74*:											
Woodhall	0-10	Gravelly loam	GM-GC, SM-SC, SM, GM	A-4	0-5	55-80	50-75	40-70	35-50	25-35	5-10
	10-34	Very stony clay loam, very cobbly loam, extremely cobbly loam.	CL-ML, GM-GC, SM-SC	A-2, A-4	35-60	45-90	40-75	30-70	25-60	20-30	5-10
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
75*:											
Rubble Land.											
Rock outcrop.											
76	0-4	Gravelly sandy loam.	SM, SW-SM, GM, GW-GM	A-2, A-1	0-5	55-90	40-75	30-60	10-35	<25	NP-5
Schamber	4-60	Gravelly sand, very gravelly sand, gravelly loamy sand.	SW, SW-SM, GW, GW-GM	A-1	0-15	30-60	15-40	5-20	0-10	<25	NP-5
77*:											
Schamber	0-5	Gravelly sandy loam.	SM, SW-SM, GM, GW-GM	A-2, A-1	0-5	55-90	40-75	30-60	10-35	<25	NP-5
	5-60	Gravelly sand, very gravelly sand, gravelly loamy sand.	SW, SW-SM, GW, GW-GM	A-1	0-15	30-60	15-40	5-20	0-10	<25	NP-5
Midway	0-3	Clay	CL	A-6, A-7	0	75-100	75-100	70-100	70-95	35-50	20-30
	3-15	Clay, clay loam, silty clay loam.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	70-95	35-60	20-35
	15	Weathered bedrock	---	---	---	---	---	---	---	---	---
78	0-3	Sandy loam	SM-SC, SC	A-2	0	75-100	75-100	50-70	25-35	20-30	5-10
Tisworth	3-15	Loam, sandy clay loam, clay loam.	SC, CL	A-6	0	75-100	75-100	65-95	35-75	25-35	10-15
	15-60	Stratified loam to sandy loam.	SM, SM-SC	A-1, A-2, A-4	0	80-100	75-100	40-80	20-50	15-25	NP-10
79*:											
Tolman	0-8	Stony sandy loam	SM	A-2, A-4	15-25	80-95	75-90	50-70	25-45	20-25	NP-5
	8-18	Very stony sandy clay loam.	SC	A-6	35-65	75-90	60-90	50-70	35-50	25-35	10-15
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
80	0-8	Loam	ML	A-4	0-15	85-100	75-100	55-80	50-65	20-30	NP-5
Trag	8-58	Clay loam, loam, sandy clay loam.	CL-ML	A-4	0-15	85-100	80-100	75-95	55-75	20-30	5-10
	58-60	Sandy clay loam, clay loam, loam.	SM-SC	A-2, A-4	0-15	80-95	75-90	60-80	30-50	15-25	5-10
81*:											
Travessilla	0-15	Channery sandy loam.	GM, SM	A-1, A-2, A-4	0-5	55-80	50-75	35-60	20-45	15-20	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kim	0-8	Fine sandy loam	SM, ML	A-4	0-5	80-100	75-100	60-90	35-55	---	NP
	8-60	Loam, clay loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	80-100	75-100	70-95	35-85	25-40	5-15

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
82*:											
Travessilla-----	0-15	Channery sandy loam.	GM, SM	A-1, A-2, A-4	0-5	55-80	50-75	35-60	20-45	15-20	NP-5
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
83*:											
Uinta-----------	0-3	Fine sandy loam	SM	A-1, A-2	0-10	80-100	80-90	50-70	15-30	---	NP
	3-15	Gravelly sandy loam, sandy loam.	SM, GM	A-1, A-2	0-10	60-100	60-90	35-65	15-30	---	NP
	15-60	Gravelly sandy clay loam, sandy clay loam, gravelly clay loam.	GC, SC, CL	A-2, A-6	0-10	55-100	55-100	45-85	25-65	25-35	10-15
Lakehelen-------	0-12	Fine sandy loam	SM	A-4	0-5	90-100	90-100	70-85	40-50	---	NP
	12-28	Very gravelly sandy clay loam, very cobbly sandy clay loam, extremely cobbly sandy clay loam.	GM, SM	A-2	25-60	60-80	50-70	45-55	25-35	30-40	5-10
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
84*:											
Ustic Torriorthents.											
Rock outcrop.											
85----------	0-15	Gravelly sandy loam.	SM	A-2, A-1, A-4	0-10	65-85	55-75	35-55	15-40	20-25	NP-5
Utica	15-36	Very gravelly sandy loam, gravelly sandy loam.	GM, GP-GM, SM, SP-SM	A-1, A-2	0-25	45-70	35-60	20-45	5-30	20-20	NP-5
	36-60	Very gravelly sand, very gravelly loamy sand, very cobbly sand.	GM, GP, GP-GM, SM	A-1	15-40	25-60	15-50	10-35	0-15	---	NP
86----------	0-6	Fine sandy loam	SM	A-2, A-4	0	100	90-100	60-90	30-45	---	NP
Vona	6-32	Fine sandy loam, sandy loam.	SM	A-2, A-4	0	100	90-100	60-90	30-45	---	NP
	32-60	Sandy loam, loamy sand.	SM	A-2	0	100	90-100	50-85	15-30	---	NP
87*:											
Wahatoya--------	0-6	Gravelly sandy loam.	SM	A-1	0-15	60-80	55-75	35-50	15-25	20-30	NP-5
	6-22	Very gravelly sandy clay loam, very gravelly clay loam, very cobbly sandy clay loam.	GC	A-2, A-6	0-45	35-60	30-55	30-50	15-40	25-35	10-15
	22	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
88---------- Welring	0-4	Very channery loam.	GM-GC	A-1, A-2	0-10	25-45	30-50	20-35	15-30	20-30	5-10
	4-18	Very channery loam.	GM-GC	A-1, A-2	0-10	25-45	30-50	20-35	15-30	20-30	5-10
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
89*:											
Wetmore----------	0-10	Very gravelly coarse sandy loam.	GM-GC, GP-GC	A-2	0-20	30-55	25-50	10-30	5-20	20-30	5-10
	10-14	Very gravelly coarse sandy loam, extremely gravelly coarse sandy loam.	SC, GC	A-2	5-40	30-60	25-50	15-20	10-15	25-35	10-15
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mortenson--------	0-6	Very stony loam	SM-SC, GM-GC	A-2, A-4	30-55	45-80	40-70	35-65	25-50	20-30	5-10
	6-22	Very stony sandy loam, very cobbly sandy loam.	SM, GM	A-1	30-55	45-80	40-70	25-50	10-25	15-25	NP-5
	22-29	Very stony sandy clay loam, very stony clay loam.	SC, GC	A-6, A-2	30-55	45-80	40-70	30-60	20-40	30-40	10-20
	29-60	Very cobbly clay, very stony clay.	CH, CL, GC, SC	A-7, A-2	30-55	40-70	35-60	30-60	25-55	45-55	20-30
90---------- Wiley	0-4	Loam----------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	4-23	Silty clay loam, silt loam, clay loam.	CL	A-6	0	100	100	90-100	70-95	25-35	10-20
	23-60	Silt loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	80-95	25-35	5-15
91*:											
Wiley----------	0-4	Loam----------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	4-23	Silty clay loam, silt loam, clay loam.	CL	A-6	0	100	100	90-100	70-95	25-35	10-20
	23-60	Silt loam, silty clay loam, loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	80-95	25-35	5-15
Kim----------	0-8	Loam----------	ML	A-4	0-5	80-100	75-100	60-90	55-75	20-35	NP-5
	8-60	Loam, clay loam, sandy clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-5	80-100	75-100	70-95	35-85	25-40	5-15
92, 93---------- Willowman	0-8	Gravelly sandy loam.	SM	A-2, A-4	0-5	70-80	70-80	50-60	30-40	20-30	NP-5
	8-15	Gravelly sandy clay loam, very cobbly sandy clay loam.	SC	A-2	0-35	70-80	70-80	55-65	25-35	30-40	10-15
	15-21	Very gravelly sandy loam, very cobbly sandy loam.	GM	A-1	10-50	40-55	35-50	25-35	10-20	---	NP
	21-60	Very gravelly loamy sand, very gravelly sand.	GP, GP-GM	A-1, A-2	15-35	45-65	35-60	5-20	0-15	---	NP

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
94*:											
Woodhall--------	0-8	Loam----------	CL-ML, ML	A-4	0-5	80-95	75-95	70-90	50-70	25-35	5-10
	8-26	Very stony clay loam, very cobbly loam, extremely cobbly loam.	CL-ML, GM-GC, SM-SC	A-2, A-4	35-60	45-90	40-75	30-70	25-60	20-30	5-10
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
1----------	0-6	40-60	0.06-0.2	0.10-0.14	7.4-8.4	2-16	High------	0.24	5	4	1-2
Apishapa	6-60	40-60	0.06-0.2	0.10-0.14	7.9-9.0	4-16	High------	0.24			
2----------	0-3	15-27	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low-------	0.24	5	5	1-2
Baca	3-30	35-45	0.2-0.6	0.16-0.18	7.4-8.4	<2	Moderate	0.32			
	30-60	15-30	0.6-2.0	0.16-0.18	7.9-8.4	<2	Moderate	0.37			
3----------	0-7	5-15	2.0-6.0	0.07-0.09	6.6-7.3	<2	Low-------	0.17	3	8	2-3
Badito	7-16	20-35	0.6-2.0	0.09-0.11	6.6-7.3	<2	Low-------	0.20			
	16-35	5-20	2.0-6.0	0.06-0.08	6.6-7.3	<2	Low-------	0.15			
	35-43	---	---	---	---	---	----------	----			
	43-60	---	---	---	---	---	----------	----			
4*:											
Bayerton-------	0-6	10-20	2.0-6.0	0.11-0.13	6.6-7.3	<2	Low-------	0.24	2	8	1-2
	6-32	20-25	0.6-2.0	0.14-0.16	6.6-7.8	<2	Low-------	0.28			
	32	---	---	---	---	---	----------	----			
Maitland-------	0-14	10-20	2.0-6.0	0.14-0.17	5.1-6.5	<2	Low-------	0.20	5	3	1-3
	14-45	20-35	0.6-2.0	0.16-0.20	5.1-6.5	<2	Moderate	0.28			
	45-60	15-26	0.6-2.0	0.12-0.18	5.6-7.8	<2	Moderate	0.28			
5*:											
Benteen---------	0-6	10-27	0.6-2.0	0.16-0.20	6.6-7.3	<2	Low-------	0.37	2	5	---
	6-24	25-35	0.6-2.0	0.12-0.16	6.6-7.8	<2	Moderate	0.32			
	24-30	20-35	0.6-2.0	0.10-0.14	7.4-8.4	<2	Moderate	0.32			
	30	---	---	---	---	---	----------	----			
Rock outcrop.											
6*:											
Bond----------	0-4	8-17	0.6-2.0	0.12-0.14	6.6-7.8	<2	Low-------	0.28	1	3	---
	4-17	20-35	0.2-0.6	0.11-0.13	6.6-7.8	<2	Moderate	0.37			
	17	---	---	---	---	---	----------	----			
Rock outcrop.											
7----------	0-33	10-18	2.0-6.0	0.09-0.12	6.1-7.8	<2	Low-------	0.20	4	5	2-5
Breece	33-60	8-18	6.0-20	0.07-0.09	6.1-7.8	<2	Low-------	0.15			
8----------	0-19	5-15	2.0-6.0	0.04-0.06	7.4-8.4	<2	Low-------	0.17	5	3	1-2
Brownsto	19-60	15-25	0.6-6.0	0.06-0.09	7.9-9.0	<2	Low-------	0.17			
9----------	0-4	5-15	2.0-6.0	0.04-0.06	7.4-8.4	<2	Low-------	0.17	5	3	1-2
Brownsto	4-60	15-25	0.6-6.0	0.06-0.09	7.9-8.4	<2	Low-------	0.17			
10---------	0-3	10-20	0.6-6.0	0.12-0.16	6.6-7.8	<2	Low-------	0.28	1	5	2-4
Castner	3-11	10-20	0.6-6.0	0.06-0.10	7.4-8.4	<2	Low-------	0.24			
	11	---	---	---	---	---	----------	----			
11---------	0-14	10-20	0.6-2.0	0.10-0.14	5.6-6.5	<2	Low-------	0.20	3	3	---
Coldcreek	14-37	10-27	0.6-2.0	0.08-0.12	5.6-6.5	<2	Low-------	0.28			
	37-50	10-35	0.6-2.0	0.05-0.09	5.6-6.5	<2	Low-------	0.28			
	50	---	---	---	---	---	----------	----			
12---------	0-14	12-20	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low-------	0.24	3	5	2-4
Collegiate	14-31	10-18	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low-------	0.24			
	31-60	0-5	>6.0	0.03-0.05	6.6-7.8	<2	Low-------	0.10			
13---------	0-7	35-40	0.06-0.2	0.19-0.21	6.6-7.8	<2	High------	0.24	5	6	2-4
Crooked Creek	7-45	35-50	0.06-0.2	0.15-0.17	6.6-7.8	<2	High------	0.24			
	45-60	30-40	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.28			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
14----------	0-15	15-25	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low--------	0.17	5	8	2-4
Curecanti	15-29	25-35	0.6-2.0	0.06-0.10	6.1-7.3	<2	Low--------	0.24			
	29-60	5-20	2.0-20	0.05-0.08	6.1-7.3	<2	Low--------	0.15			
15----------	0-8	27-40	0.2-0.6	0.16-0.20	6.6-7.8	<2	Moderate	0.28	5	4	2-4
Denver	8-60	40-60	0.06-0.2	0.14-0.18	6.6-8.4	<2	High------	0.28			
16----------	0-4	10-20	2.0-6.0	0.06-0.08	6.1-7.8	<2	Low--------	0.15	1	8	1-3
Farisita	4-12	10-20	2.0-6.0	0.09-0.11	6.1-7.8	<2	Low--------	0.15			
	12-24	---	---	---	---	---	----------	----			
	24	---	---	---	---	---	----------	----			
17, 18----------	0-4	15-27	0.6-2.0	0.16-0.20	6.6-7.8	<2	Low--------	0.24	5	6	1-2
Fort Collins	4-23	18-35	0.6-2.0	0.16-0.18	6.6-7.8	<2	Moderate	0.24			
	23-60	12-27	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low--------	0.24			
19----------	0-5	20-35	0.6-2.0	0.16-0.18	6.6-7.8	<2	Moderate	0.24	5	5	2-4
Fughes	5-38	35-50	0.06-0.2	0.15-0.17	6.6-7.8	<2	High------	0.32			
	38-60	27-35	0.2-0.6	0.14-0.16	6.6-7.8	<2	High------	0.28			
20----------	0-5	5-20	2.0-6.0	0.10-0.13	6.6-7.8	<2	Low--------	0.15	5	3	2-3
Gelkie	5-22	20-35	0.6-2.0	0.10-0.13	6.6-8.4	<2	Moderate	0.20			
	22-60	5-20	2.0-6.0	0.05-0.13	7.9-8.4	<2	Low--------	0.15			
21----------	0-7	5-20	2.0-6.0	0.10-0.13	6.6-7.8	<2	Low--------	0.15	5	3	2-3
Gelkie	7-18	20-35	0.6-2.0	0.10-0.13	6.6-8.4	<2	Moderate	0.20			
	18-60	5-20	2.0-6.0	0.05-0.13	7.9-8.4	<2	Low--------	0.15			
22----------	0-8	10-20	2.0-6.0	0.09-0.13	7.4-8.4	<2	Low--------	0.15	5	3	.5-1
Glenberg	8-60	8-18	2.0-6.0	0.07-0.12	7.4-8.4	<2	Low--------	0.15			
23----------	0-4	27-32	0.2-0.6	0.12-0.14	6.6-7.8	<2	Low--------	0.10	2	8	1-2
Goemmer	4-21	35-50	0.06-0.2	0.12-0.14	6.1-7.8	<2	High------	0.28			
	21-32	30-40	0.06-0.2	0.12-0.14	6.1-7.8	<2	Moderate	0.28			
	32	---	---	---	---	---	----------	----			
24----------	0-8	27-35	0.2-0.6	0.16-0.19	7.4-8.4	<8	Moderate	0.28	5	4L	.5-2
Haverson	8-60	18-35	0.6-2.0	0.14-0.18	7.4-8.4	<8	Low--------	0.24			
25----------	0-8	10-27	0.6-2.0	0.17-0.21	6.1-7.8	<2	Low--------	0.24	5	5	2-4
Holderness	8-51	35-50	0.06-0.2	0.15-0.17	6.6-7.8	<2	High------	0.28			
	51	---	---	---	---	---	----------	----			
26----------	0-6	10-20	2.0-6.0	0.14-0.16	7.9-8.4	<2	Low--------	0.28	5	3	.5-1
Kim	6-60	20-35	0.6-2.0	0.15-0.17	7.9-8.4	<8	Moderate	0.32			
27*:											
Kim----------	0-9	15-25	0.6-2.0	0.15-0.18	7.4-8.4	<2	Low--------	0.32	5	4L	.5-1
	9-60	20-35	0.6-2.0	0.16-0.17	7.9-8.4	<2	Moderate	0.32			
Cascajo---------	0-5	5-15	2.0-6.0	0.07-0.11	7.4-8.4	<2	Low--------	0.17	5	8	.5-1
	5-20	0-15	6.0-20	0.05-0.08	7.9-8.4	<2	Low--------	0.10			
	20-60	0-5	6.0-20	0.05-0.06	7.4-8.4	<2	Low--------	0.10			
28*:											
Lakehelen-------	0-12	8-15	2.0-6.0	0.13-0.15	5.6-6.5	<2	Low--------	0.28	2	3	<.5
	12-28	20-25	0.6-2.0	0.04-0.05	5.6-6.5	<2	Low--------	0.17			
	28	---	---	---	---	---	----------	----			
Rock outcrop.											
29----------	0-8	10-25	0.6-2.0	0.16-0.18	6.1-7.3	<2	Low--------	0.32	5	5	.5-1
Larkson	8-60	35-45	0.06-0.2	0.15-0.17	6.6-7.8	<2	High------	0.24			
30----------	0-10	15-20	2.0-6.0	0.12-0.16	5.6-7.3	<2	Low--------	0.24	5	3	.5-1
Leadville	10-39	25-35	0.6-2.0	0.06-0.10	5.6-7.3	<2	Low--------	0.10			
	39-60	20-27	0.6-2.0	0.05-0.07	6.1-7.3	<2	Low--------	0.10			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
31----------	0-14	10-20	2.0-6.0	0.10-0.14	6.1-7.3	<2	Low--------	0.24	5	3	2-4
Libeg	14-60	20-35	0.6-2.0	0.05-0.09	6.1-7.8	<2	Low--------	0.24			
32*:											
Libeg----------	0-14	10-20	2.0-6.0	0.10-0.14	6.1-7.3	<2	Low--------	0.24	5	3	2-4
	14-60	20-35	0.6-2.0	0.05-0.09	6.1-7.8	<2	Low--------	0.24			
Coutis----------	0-32	12-18	2.0-6.0	0.13-0.15	6.1-7.8	<2	Low--------	0.20	5	3	2-4
	32-50	12-18	2.0-6.0	0.13-0.15	6.6-7.8	<2	Low--------	0.20			
	50-60	8-15	2.0-6.0	0.08-0.10	6.6-7.8	<2	Low--------	0.20			
33----------	0-2	30-40	0.2-0.6	0.14-0.17	7.9-8.4	2-8	High-------	0.28	5	4	.5-1
Limon	2-60	40-60	0.06-0.2	0.12-0.16	7.9-9.0	2-8	High-------	0.32			
34----------	0-2	40-60	0.06-0.2	0.14-0.16	7.9-8.4	2-8	High-------	0.24	5	4	.5-1
Limon	2-60	40-60	0.06-0.2	0.12-0.16	7.9-9.0	2-8	High-------	0.32			
35----------	0-19	15-25	0.6-2.0	0.08-0.12	5.1-6.5	<2	Low--------	0.32	5	6	.5-1
Loberg	19-52	35-50	0.06-0.2	0.06-0.10	5.6-7.3	<2	Moderate	0.28			
	52-60	35-45	0.06-0.2	0.05-0.09	6.1-7.8	<2	Moderate	0.28			
36*:											
Louviers--------	0-3	27-40	0.2-0.6	0.10-0.12	6.6-7.8	<2	Moderate	0.32	1	8	.5-1
	3-16	35-60	0.06-0.2	0.14-0.17	6.6-7.8	<2	High-------	0.37			
	16	---	---	---	---	---	----------	----			
Travessilla-----	0-15	5-18	0.6-2.0	0.13-0.15	7.4-8.4	<2	Low--------	0.32	1	5	---
	15	10-18	0.6-2.0	0.13-0.15	7.4-8.4	<2	Low--------	0.32			
	8	---	---	---	---	---	----------	----			
37*:											
Louviers--------	0-3	27-40	0.2-0.6	0.10-0.12	6.6-7.8	<2	Moderate	0.32	1	8	.5-1
	3-16	35-60	0.06-0.2	0.14-0.17	6.6-7.8	<2	High-------	0.37			
	16	---	---	---	---	---	----------	----			
Travessilla-----	0-15	5-18	0.6-2.0	0.13-0.15	7.4-8.4	<2	Low--------	0.32	1	5	---
	15	---	---	---	---	---	----------	----			
Rock outcrop.											
38----------	0-3	10-20	0.6-2.0	0.12-0.14	6.6-7.3	<2	Low--------	0.24	2	---	1-2
Lymanson	3-29	15-35	0.6-2.0	0.14-0.16	6.6-8.4	<2	Moderate	0.32			
	29	---	---	---	---	---	----------	----			
39----------	0-10	10-20	2.0-6.0	0.14-0.17	5.1-6.5	<2	Low--------	0.20	5	3	1-3
Maitland	10-45	25-35	0.6-2.0	0.16-0.20	5.1-6.5	<2	Moderate	0.28			
	45-60	15-26	0.6-2.0	0.12-0.18	5.6-7.8	<2	Moderate	0.28			
40----------	0-5	28-35	0.2-0.6	0.16-0.18	7.9-8.4	<2	Moderate	0.43	5	4L	.5-2
Manvel	5-60	18-35	0.2-2.0	0.16-0.18	7.9-8.4	2-4	Moderate	0.43			
41----------	0-3	27-35	0.6-2.0	0.10-0.16	7.9-8.4	>4	Moderate	0.28	5	4L	.5-1
Manvel	3-60	18-35	0.2-0.6	0.10-0.14	7.9-9.0	>8	Moderate	0.37			
42*:											
Manvel----------	0-3	15-27	0.6-2.0	0.18-0.20	7.9-8.4	<2	Moderate	0.37	5	4L	.5-2
	3-60	18-35	0.2-2.0	0.16-0.18	7.9-8.4	2-4	Moderate	0.43			
Minnequa--------	0-6	15-27	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.32	2	4L	.5-2
	6-33	18-35	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low--------	0.37			
	33	---	---	---	---	---	----------	----			
43----------	0-8	10-25	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low--------	0.28	5	6	2-3
Manzano	8-37	18-30	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.32			
	37-60	15-20	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low--------	0.24			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
44----------	0-4	27-35	0.2-2.0	0.19-0.20	7.4-8.4	<4	Moderate	0.24	5	4L	1-2
Manzanola	4-30	35-45	0.06-0.2	0.15-0.18	7.4-8.4	<2	High------	0.28			
	30-60	30-40	0.2-0.6	0.16-0.18	7.9-9.0	<8	Moderate	0.24			
45----------	0-3	27-35	0.2-2.0	0.19-0.20	7.4-8.4	<4	Moderate	0.24	5	4L	1-2
Manzanola	3-32	35-45	0.06-0.2	0.15-0.18	7.4-8.4	<2	High------	0.28			
	32-60	30-40	0.2-0.6	0.16-0.18	7.9-9.0	<8	Moderate	0.24			
46----------	0-4	40-60	0.06-0.2	0.14-0.18	7.9-8.4	2-4	High------	0.43	1	4	.5-2
Midway	4-14	35-45	0.06-0.2	0.14-0.18	7.9-9.0	2-8	High------	0.43			
	14	---	---	---	---	---	----------	----			
47*:											
Minnequa-----	0-10	15-20	2.0-6.0	0.13-0.16	7.4-8.4	<2	Low-------	0.37	2	3	.5-2
	10-33	18-35	0.6-2.0	0.16-0.18	7.9-9.0	<4	Low-------	0.37			
	33	---	---	---	---	---	----------	----			
Otero----------	0-6	10-20	2.0-6.0	0.11-0.13	7.4-8.4	<2	Low-------	0.20	5	3	.5-2
	6-60	5-18	2.0-6.0	0.08-0.12	7.9-8.4	<4	Low-------	0.17			
48*:											
Montez----------	0-7	10-20	2.0-6.0	0.11-0.13	6.1-7.8	<2	Low-------	0.20	3	3	3-5
	7-28	3-15	2.0-20.0	0.06-0.13	6.1-7.8	<2	Low-------	0.15			
	28-41	20-35	0.6-2.0	0.12-0.14	6.1-7.8	<2	Moderate	0.24			
	41-50	3-10	>20.0	0.05-0.07	6.1-7.8	<2	Low-------	0.15			
	50	---	---	---	---	---	----------	----			
Rogert----------	0-7	15-20	2.0-6.0	0.07-0.09	6.1-7.8	<2	Low-------	0.24	1	8	2-4
	7-14	5-18	>6.0	0.05-0.07	6.1-7.8	<2	Low-------	0.15			
	14	---	---	---	---	---	----------	----			
49----------	0-7	15-27	0.6-2.0	0.16-0.18	6.6-7.3	<2	Low-------	0.24	5	5	2-4
Morop	7-30	35-50	0.06-0.2	0.14-0.16	6.6-7.3	<2	High------	0.28			
	30-40	35-50	0.2-0.6	0.10-0.12	6.6-7.8	<2	Moderate	0.24			
	40-60	15-35	0.6-2.0	0.10-0.12	7.9-8.4	<2	Low-------	0.24			
50, 51----------	0-5	10-20	2.0-6.0	0.13-0.15	7.4-8.4	<2	Low-------	0.20	5	3	.5-1
Neville	5-60	18-35	0.6-2.0	0.15-0.18	7.9-8.4	<2	Low-------	0.24			
52, 53----------	0-10	8-15	2.0-6.0	0.11-0.13	6.6-7.3	<2	Low-------	0.24	5	3	1-3
Noden	10-30	20-35	0.6-2.0	0.14-0.16	6.6-7.8	<2	Moderate	0.28			
	30-60	8-15	0.6-2.0	0.14-0.16	7.4-7.8	<2	Low-------	0.28			
54----------	0-7	18-25	0.6-2.0	0.16-0.18	6.6-7.3	<2	Low-------	0.28	5	6	1-3
Noden	7-32	20-35	0.6-2.0	0.14-0.16	6.6-7.8	<2	Moderate	0.28			
	32-60	15-25	0.6-2.0	0.16-0.18	7.4-7.8	<2	Low-------	0.28			
55*:											
Noden----------	0-10	8-15	2.0-6.0	0.11-0.13	6.6-7.3	<2	Low-------	0.24	5	3	1-3
	10-30	20-35	0.6-2.0	0.14-0.16	6.6-7.8	<2	Moderate	0.28			
	30-60	8-15	0.6-2.0	0.14-0.16	7.4-7.8	<2	Low-------	0.28			
Bond----------	0-4	8-17	0.6-2.0	0.12-0.14	6.6-7.8	<2	Low-------	0.28	1	3	---
	4-17	20-35	0.2-0.6	0.11-0.13	6.6-7.8	<2	Moderate	0.37			
	17	---	---	---	---	---	----------	----			
56*:											
Noden----------	0-7	18-25	0.6-2.0	0.16-0.18	6.6-7.3	<2	Low-------	0.28	5	6	1-3
	7-32	20-35	0.6-2.0	0.14-0.16	6.6-7.8	<2	Moderate	0.28			
	32-60	15-25	0.6-2.0	0.16-0.18	7.4-7.8	<2	Low-------	0.28			
Bond----------	0-3	15-20	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low-------	0.37	1	5	---
	3-16	20-35	0.2-0.6	0.11-0.13	6.6-7.8	<2	Moderate	0.37			
	16	---	---	---	---	---	----------	----			
57----------	0-4	15-25	0.2-2.0	0.15-0.20	6.1-7.8	<2	Moderate	0.24	5	6	2-4
Nunn	4-16	35-45	0.06-0.2	0.15-0.18	7.4-8.4	<2	High------	0.28			
	16-60	15-25	2.0-6.0	0.11-0.14	7.9-8.4	<2	Low-------	0.20			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
58---------- Nunn	0-8	15-25	0.6-2.0	0.16-0.18	6.1-7.3	<2	Low--------	0.24	5	8	1-3
	8-42	35-50	0.06-0.6	0.15-0.18	6.6-8.4	<2	High-------	0.28			
	42-60	15-30	0.2-2.0	0.10-0.18	7.9-8.4	<2	Moderate	0.24			
59---------- Nunn	0-5	27-35	0.2-2.0	0.15-0.20	6.1-7.8	<2	Moderate	0.24	5	6	2-4
	5-33	35-45	0.06-0.2	0.15-0.18	7.4-8.4	<2	High-------	0.28			
	33-60	25-40	0.2-0.6	0.10-0.18	7.9-8.4	<2	Moderate	0.24			
60---------- Olney	0-3	10-20	0.6-6.0	0.11-0.15	6.6-7.8	<2	Low--------	0.20	5	3	1-2
	3-13	18-35	0.6-2.0	0.13-0.15	6.6-7.8	<2	Low--------	0.24			
	13-18	15-30	0.6-6.0	0.11-0.15	7.9-8.4	<2	Low--------	0.24			
	18-60	5-18	2.0-6.0	0.06-0.13	7.9-8.4	<2	Low--------	0.17			
61*:											
Olney----------	0-4	10-20	0.6-6.0	0.11-0.15	6.6-7.8	<2	Low--------	0.20	5	3	1-2
	4-26	18-35	0.6-2.0	0.13-0.15	6.6-7.8	<2	Low--------	0.24			
	26-60	15-30	0.6-6.0	0.11-0.15	7.9-8.4	<2	Low--------	0.24			
Progresso-------	0-5	10-20	2.0-6.0	0.10-0.14	6.6-7.8	<2	Low--------	0.24	2	3	.5-.9
	5-15	20-35	0.6-2.0	0.14-0.16	7.4-8.4	<2	Moderate	0.32			
	15-24	10-18	2.0-6.0	0.10-0.13	7.9-8.4	<2	Low--------	0.28			
	24	---	---	---	---	---	----------	----			
62---------- Otero	0-7	10-20	2.0-6.0	0.11-0.13	7.4-8.4	<2	Low--------	0.20	5	3	.5-2
	7-60	5-18	2.0-6.0	0.08-0.12	7.9-8.4	<4	Low--------	0.17			
63---------- Otero	0-6	10-20	2.0-6.0	0.11-0.13	7.4-8.4	<2	Low--------	0.20	5	3	.5-2
	6-60	5-18	2.0-6.0	0.08-0.12	7.9-8.4	<4	Low--------	0.17			
64---------- Patent	0-2	20-27	0.6-2.0	0.20-0.22	7.4-8.4	<2	Moderate	0.32	5	4L	1-3
	2-60	18-35	0.2-2.0	0.14-0.19	7.9-8.4	<2	Moderate	0.32			
65*:											
Penrose----------	0-14	15-27	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low--------	0.17	1	8	.5-1
	14	---	---	---	---	---	----------	----			
Minnequa--------	0-6	15-27	0.6-2.0	0.18-0.20	7.4-8.4	<2	Low--------	0.32	2	4L	.5-2
	6-33	18-35	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low--------	0.37			
	33	---	---	---	---	---	----------	----			
66*:											
Penrose----------	0-15	15-27	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low--------	0.17	1	8	.5-1
	15	---	---	---	---	---	----------	----			
Rock outcrop.											
67---------- Potts	0-5	8-15	2.0-6.0	0.11-0.13	6.6-8.4	<2	Low--------	0.28	5	3	1-2
	5-27	25-35	0.6-2.0	0.19-0.21	6.6-8.4	<2	Moderate	0.43			
	27-35	15-25	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low--------	0.55			
	35-60	8-15	2.0-6.0	0.10-0.12	7.9-9.0	<2	Low--------	0.20			
68---------- Razor	0-3	28-40	0.06-0.2	0.15-0.18	6.6-8.4	<2	High-------	0.32	2	4L	.5-2
	3-23	35-60	0.06-0.2	0.15-0.18	7.9-8.4	<2	High-------	0.28			
	23-32	35-60	0.06-0.2	0.15-0.18	7.9-8.4	>8	High-------	0.28			
	32	---	---	---	---	---	----------	----			
69---------- Razor	0-7	40-50	0.06-0.2	0.15-0.18	6.6-8.4	<2	High-------	0.28	2	4	.5-2
	7-20	35-60	0.06-0.2	0.15-0.18	7.9-8.4	<2	High-------	0.28			
	20-35	35-60	0.06-0.2	0.15-0.18	7.9-8.4	>8	High-------	0.28			
	35	---	---	---	---	---	----------	----			
70---------- Ring	0-10	10-20	2.0-6.0	0.08-0.12	6.1-6.5	<2	Low--------	0.20	5	4	---
	10-19	35-50	0.2-0.6	0.10-0.14	6.1-6.5	<2	Moderate	0.24			
	19-37	35-50	0.2-0.6	0.05-0.10	6.6-7.3	<2	Moderate	0.24			
	37-60	20-35	0.6-2.0	0.04-0.09	6.6-7.3	<2	Low--------	0.24			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
71----------	0-5	18-25	0.6-2.0	0.11-0.17	6.1-6.5	<2	Low--------	0.32	5	6	---
Ring	5-15	35-50	0.2-0.6	0.10-0.14	6.1-6.5	<2	Moderate	0.24			
	15-40	35-50	0.2-0.6	0.05-0.10	6.6-7.3	<2	Moderate	0.24			
	40-60	20-35	0.6-2.0	0.04-0.09	6.6-7.3	<2	Low--------	0.24			
72*:											
Riverwash.											
Las Animas------	0-6	7-20	2.0-20	0.09-0.12	7.4-8.4	4-16	Low--------	0.17	5	3	.5-2
	6-60	7-18	2.0-20	0.07-0.12	7.4-8.4	4-8	Low--------	0.17			
73*.											
Rock outcrop											
74*:											
Rogert----------	0-6	5-15	2.0-6.0	0.05-0.07	6.1-7.8	<2	Low--------	0.20	1	8	2-4
	6-16	5-18	>6.0	0.05-0.07	6.1-7.8	<2	Low--------	0.15			
	16	---	---	---	---	---	----------	----			
Woodhall--------	0-10	20-25	0.6-2.0	0.14-0.16	6.1-7.3	<2	Low--------	0.24	2	8	2-4
	10-34	20-35	0.6-2.0	0.10-0.14	6.1-7.3	<2	Low--------	0.20			
	34	---	---	---	---	---	----------	----			
75*:											
Rubble Land.											
Rock outcrop.											
76----------	0-4	10-20	>6.0	0.03-0.06	6.1-8.4	<2	Low--------	0.17	2	6	.5-2
Schamber	4-60	2-10	>6.0	0.03-0.06	7.4-8.4	<2	Low--------	0.10			
77*:											
Schamber--------	0-5	10-20	>6.0	0.03-0.06	7.4-8.4	<2	Low--------	0.17	2	6	.5-2
	5-60	2-10	>6.0	0.03-0.06	7.9-8.4	<2	Low--------	0.10			
Midway----------	0-3	40-60	0.06-0.2	0.14-0.18	7.9-8.4	2-4	High-------	0.43	1	4	.5-2
	3-15	35-45	0.06-0.2	0.14-0.18	7.9-9.0	2-8	High-------	0.43			
	15	---	---	---	---	---	----------	----			
78----------	0-3	10-18	2.0-6.0	0.05-0.07	>7.8	>4	Low--------	0.32	5	3	1-2
Tisworth	3-15	18-35	0.06-0.2	0.07-0.11	>8.4	>4	Moderate	0.49			
	15-60	5-20	0.6-6.0	0.07-0.10	>8.4	>4	Low--------	0.32			
79*:											
Tolman----------	0-8	10-20	2.0-6.0	0.08-0.10	6.1-7.3	<2	Low--------	0.20	1	8	2-4
	8-18	20-30	0.6-2.0	0.07-0.09	6.6-7.3	<2	Low--------	0.15			
	18	---	---	---	---	---	----------	----			
Rock outcrop.											
80----------	0-8	15-25	0.6-2.0	0.14-0.16	6.1-7.3	<2	Low--------	0.24	5	5	2-4
Trag	8-58	18-35	0.6-2.0	0.14-0.16	6.1-7.3	<2	Low--------	0.32			
	58-60	18-30	0.6-2.0	0.12-0.16	6.1-7.3	<2	Low--------	0.28			
81*:											
Travessilla------	0-15	5-18	0.6-2.0	0.13-0.15	7.4-8.4	<2	Low--------	0.32	1	5	---
	15	---	---	---	---	---	----------	----			
Kim----------	0-8	10-20	2.0-6.0	0.14-0.16	7.9-8.4	<2	Low--------	0.28	5	3	.5-1
	8-60	20-35	0.6-2.0	0.15-0.17	7.9-8.4	<8	Moderate	0.32			
82*:											
Travessilla------	0-15	5-18	0.6-2.0	0.13-0.15	7.4-8.4	<2	Low--------	0.32	1	5	---
	15	---	---	---	---	---	----------	----			
Rock outcrop.											

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
83*:											
Uinta	0-3	5-15	2.0-6.0	0.07-0.13	6.6-7.3	<2	Low	0.17	5	3	1-2
	3-15	5-15	2.0-6.0	0.07-0.13	6.1-7.3	<2	Low	0.17			
	15-60	20-30	0.6-2.0	0.08-0.15	6.1-7.8	<2	Moderate	0.20			
Lakehelen	0-12	8-15	2.0-6.0	0.13-0.15	5.6-6.5	<2	Low	0.28	2	3	<.5
	12-28	20-25	0.6-2.0	0.04-0.05	5.6-6.5	<2	Low	0.17			
	28	---	---	---	---	---	---	----			
84*:											
Ustic Torriorthents.											
Rock outcrop.											
85	0-15	5-15	2.0-6.0	0.12-0.15	7.4-8.4	<2	Low	0.17	5	5	1-3
Utica	15-36	5-10	2.0-6.0	0.07-0.10	7.9-8.4	<2	Low	0.17			
	36-60	0-5	6.0-20.0	0.02-0.05	7.9-9.0	<2	Low	0.10			
86	0-6	5-10	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low	0.20	5	3	.5-1
Vona	6-32	10-18	2.0-6.0	0.12-0.14	6.6-8.4	<4	Low	0.24			
	32-60	3-15	6.0-20	0.08-0.11	7.9-8.4	<4	Low	0.20			
87*:											
Wahatoya	0-6	10-20	2.0-6.0	0.07-0.11	6.1-7.3	<2	Low	0.20	2	3	1-2
	6-22	18-35	0.6-2.0	0.06-0.11	6.1-7.3	<2	Moderate	0.28			
	22	---	---	---	---	---	---	----			
Rock outcrop.											
88	0-4	15-25	0.6-2.0	0.07-0.09	7.4-8.4	<2	Low	0.02	1	8	<1
Welring	4-18	15-25	0.6-2.0	0.07-0.09	7.9-8.4	<2	Low	0.05			
	18	---	---	---	---	---	---	----			
89*:											
Wetmore	0-10	5-10	6.0-20	0.05-0.07	6.1-7.3	<2	Low	0.10	1	8	.5-1
	10-14	10-20	6.0-20	0.07-0.09	6.1-7.3	<2	Low	0.10			
	14	---	---	---	---	---	---	----			
Mortenson	0-6	10-27	0.6-2.0	0.07-0.09	6.1-7.3	<2	Low	0.24	5	8	<1
	6-22	10-20	2.0-6.0	0.05-0.07	6.1-7.3	<2	Low	0.20			
	22-29	20-35	0.6-2.0	0.07-0.09	6.1-7.3	<2	Low	0.20			
	29-60	40-50	0.06-0.2	0.07-0.09	6.1-7.3	<2	Moderate	0.17			
90	0-4	15-27	0.6-2.0	0.19-0.21	7.4-8.4	<2	Low	0.37	5	4L	.5-1
Wiley	4-23	18-35	0.6-2.0	0.19-0.21	7.9-8.4	<2	Moderate	0.32			
	23-60	18-35	0.6-2.0	0.16-0.21	7.9-8.4	<2	Moderate	0.37			
91*:											
Wiley	0-4	15-27	0.6-2.0	0.19-0.21	7.4-8.4	<2	Low	0.37	5	4L	.5-1
	4-23	18-35	0.6-2.0	0.19-0.21	7.9-8.4	<2	Moderate	0.32			
	23-60	18-35	0.6-2.0	0.16-0.21	7.9-8.4	<2	Moderate	0.37			
Kim	0-8	15-27	0.6-2.0	0.16-0.18	7.4-8.4	<2	Low	0.32	5	4L	.5-1
	8-60	20-35	0.6-2.0	0.15-0.17	7.9-8.4	<8	Moderate	0.32			
92, 93	0-8	10-15	0.6-2.0	0.11-0.13	7.4-7.8	<2	Low	0.28	5	3	1-2
Willowman	8-15	20-30	0.6-2.0	0.12-0.14	7.4-7.8	<2	Moderate	0.24			
	15-21	10-15	2.0-6.0	0.07-0.09	7.9-8.4	<2	Low	0.15			
	21-60	0-8	6.0-20	0.05-0.07	7.9-8.4	<2	Low	0.10			
94*:											
Woodhall	0-8	20-25	0.6-2.0	0.15-0.17	6.1-7.3	<2	Low	0.24	2	5	2-4
	8-26	20-35	0.6-2.0	0.10-0.14	6.1-7.3	<2	Low	0.20			
	26	---	---	---	---	---	---	----			
Rock outcrop.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," and "apparent" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1---------- Apishapa	C	Frequent----	Brief-----	May-Jun	1.0-3.0	Apparent	May-Jul	>60	---	Moderate	High-----	Moderate.
2---------- Baca	C	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
3---------- Badito	C	None--------	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate	Low.
4*:												
Bayerton----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	Low.
Maitland----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
5*:												
Benteen----------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	Low.
Rock outcrop.												
6*:												
Bond----------	D	None--------	---	---	>6.0	---	---	12-20	Hard	Low------	High-----	Low.
Rock outcrop.												
7---------- Breece	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
8, 9---------- Brownsto	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
10---------- Castner	C	None--------	---	---	>6.0	---	---	6-20	Hard	Moderate	High-----	Low.
11---------- Coldcreek	B	None--------	---	---	>6.0	---	---	40-60	Soft	Moderate	Moderate	Moderate.
12---------- Collegiate	C	Rare--------	---	---	1.5-3.0	Apparent	Mar-Jul	>60	---	High-----	High-----	Low.
13---------- Crooked Creek	D	Occasional	Brief-----	Mar-Jun	1.0-2.5	Apparent	Jan-Jul	>60	---	High-----	High-----	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
14---------- Curecanti	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
15---------- Denver	C	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
16---------- Farisita	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low------	Moderate	Low.
17, 18---------- Fort Collins	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
19---------- Fughes	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
20, 21---------- Gelkie	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
22---------- Glenberg	B	Rare--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
23---------- Goemmer	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	Moderate	Low.
24---------- Haverson	B	Rare--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
25---------- Holderness	C	None--------	---	---	>6.0	---	---	40-60	Soft	Moderate	High-----	Low.
26---------- Kim	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
27*: Kim----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Cascajo----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate	Low.
28*: Lakehelen--------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	Moderate.
Rock outcrop.												
29---------- Larkson	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
30---------- Leadville	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
31--Libeg	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
32*:												
Libeg	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Coutis	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
33--Limon	C	Occasional	Brief	May-Sep	>6.0	---	---	>60	---	Low	High	Moderate.
34--Limon	C	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
35--Loberg	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
36*:												
Louviers	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Low	Low.
Travessilla	D	None	---	---	>6.0	---	---	6-20	Hard	Low	Moderate	Low.
37*:												
Louviers	D	None	---	---	>6.0	---	---	10-20	Soft	Low	Low	Low.
Travessilla	D	None	---	---	>6.0	---	---	6-20	Hard	Low	Moderate	Low.
Rock outcrop.												
38--Lymanson	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	High	Low.
39--Maitland	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
40--Manvel	B	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
41--Manvel	C	None	---	---	>6.0	---	---	>60	---	Low	High	High.
42*:												
Manvel	B	None	---	---	>6.0	---	---	>60	---	Low	High	Moderate.
Minnequa	B	None	---	---	>6.0	---	---	20-40	Soft	Low	High	Moderate.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
43---------- Manzano	C	Rare---------	---	---	>6.0	---	---	>60	---	---	High-----	Low.
44, 45---------- Manzanola	C	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Moderate.
46---------- Midway	D	None---------	---	---	>6.0	---	---	10-20	Soft	Low------	High-----	High.
47*: Minnequa---------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Low------	High-----	Moderate.
Otero----------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
48*: Montez----------	B	None---------	---	---	>6.0	---	---	40-60	Hard	Moderate	High-----	Low.
Rogert----------	D	None---------	---	---	>6.0	---	---	10-20	Hard	Low------	High-----	Low.
49---------- Morop	C	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
50, 51---------- Neville	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
52, 53, 54-------- Noden	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
55*, 56*: Noden----------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Bond----------	D	None---------	---	---	>6.0	---	---	12-20	Hard	Low------	High-----	Low.
57, 58, 59-------- Nunn	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
60---------- Olney	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
61*: Olney----------	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
Progresso--------	C	None---------	---	---	>6.0	---	---	20-40	Hard	Low------	High-----	Low.
62, 63---------- Otero	B	None---------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
64---------- Patent	C	None--------	---	---	>6.0	---	---	>60	---	Low-------	High------	Low.
65*:												
Penrose----------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low-------	High------	Low.
Minnequa----------	B	None--------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	Moderate.
66*:												
Penrose----------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low-------	High------	Low.
Rock outcrop.												
67---------- Potts	B	None--------	---	---	>6.0	---	---	>60	---	Low-------	High------	Moderate.
68, 69---------- Razor	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low-------	High------	High.
70, 71---------- Ring	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High------	Low.
72*:												
Riverwash.												
Las Animas-------	D	Frequent----	Brief-----	May-Aug	0-1.5	Apparent	May-Jul	>60	---	High------	High------	Moderate.
73*. Rock outcrop												
74*:												
Rogert----------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Low-------	High------	Low.
Woodhall----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	Low.
75*:												
Rubble Land.												
Rock outcrop.												
76---------- Schamber	A	None--------	---	---	>6.0	---	---	>60	---	Low-------	Moderate	Low.
77*:												
Schamber----------	A	None--------	---	---	>6.0	---	---	>60	---	Low-------	Moderate	Low.
Midway----------	D	None--------	---	---	>6.0	---	---	10-20	Soft	Low-------	High------	High.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
78---------- Tisworth	C	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	High.
79*: Tolman----------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate	Low.
Rock outcrop.												
80---------- Trag	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
81*: Travessilla------	D	None--------	---	---	>6.0	---	---	6-20	Hard	Low------	Moderate	Low.
Kim----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
82*: Travessilla------	D	None--------	---	---	>6.0	---	---	6-20	Hard	Low------	Moderate	Low.
Rock outcrop.												
83*: Uinta----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Lakehelen--------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	Moderate.
84*: Ustic Torriorthents.												
Rock outcrop.												
85---------- Utica	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
86---------- Vona	B	None--------	---	---	>6.0	---	---	>60	---	Low------	High-----	Low.
87*: Wahatoya----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	Low.
Rock outcrop.												
88---------- Welring	D	None--------	---	---	>6.0	---	---	8-20	Hard	Moderate	High-----	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
89*:												
Wetmore	D	None	---	---	>6.0	---	---	8-20	Hard	Low	Moderate	Low.
Mortenson	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
90--- Wiley	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
91*:												
Wiley	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
Kim	B	None	---	---	>6.0	---	---	>60	---	Low	High	Low.
92, 93--- Willowman	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
94*:												
Woodhall	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	Low.
Rock outcrop.												

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Apishapa	Fine, montmorillonitic (calcareous), mesic Vertic Fluvaquents
Baca	Fine, montmorillonitic, mesic Ustollic Haplargids
Badito	Loamy-skeletal, mixed Aridic Argiborolls
Bayerton	Fine-loamy, mixed Typic Eutroboralfs
Benteen	Fine-loamy, mixed Argic Pachic Cryoborolls
Bond	Loamy, mixed, mesic Lithic Ustollic Haplargids
Breece	Coarse-loamy, mixed Pachic Haploborolls
Brownsto	Loamy-skeletal, mixed Borollic Calciorthids
Cascajo	Sandy-skeletal, mixed, mesic Ustollic Calciorthids
Castner	Loamy-skeletal, mixed Lithic Haploborolls
Coldcreek	Loamy-skeletal, mixed Typic Paleboralfs
Collegiate	Coarse-loamy over sandy or sandy-skeletal, mixed, frigid Cumulic Haplaquolls
Coutis	Coarse-loamy, mixed Pachic Cryoborolls
Crooked Creek	Fine, montmorillonitic, frigid Cumulic Haplaquolls
Curecanti	Loamy-skeletal, mixed Typic Argiborolls
Denver	Fine, montmorillonitic, mesic Torrertic Argiustolls
Farisita	Loamy, mixed, nonacid, mesic, shallow Ustic Torriorthents
Fort Collins	Fine-loamy, mixed, mesic Ustollic Haplargids
Fughes	Fine, montmorillonitic Pachic Argiborolls
Gelkie	Fine-loamy, mixed Argic Cryoborolls
Glenberg	Coarse-loamy, mixed (calcareous), mesic Ustic Torrifluvents
Goemmer	Fine, mixed, frigid Typic Ustochrepts
Haverson	Fine-loamy, mixed (calcareous), mesic Ustic Torrifluvents
Holderness	Fine, montmorillonitic Aridic Argiborolls
Kim	Fine-loamy, mixed (calcareous), mesic Ustic Torriorthents
Lakehelen	Loamy-skeletal, mixed Typic Cryoboralfs
Larkson	Fine, montmorillonitic Typic Eutroboralfs
Las Animas	Coarse-loamy, mixed (calcareous), mesic Typic Fluvaquents
Leadville	Loamy-skeletal, mixed Typic Cryoboralfs
Libeg	Loamy-skeletal, mixed Argic Cryoborolls
Limon	Fine, montmorillonitic (calcareous), mesic Ustertic Torriorthents
Loberg	Clayey-skeletal, mixed Typic Cryoboralfs
Louviers	Clayey, mixed, nonacid, mesic, shallow Ustic Torriorthents
Lymanson	Fine-loamy, mixed Argic Cryoborolls
Maitland	Fine-loamy, mixed Mollic Eutroboralfs
Manvel	Fine-silty, mixed (calcareous), mesic Ustic Torriorthents
Manzano	Fine-loamy, mixed, mesic Cumulic Haplustolls
Manzanola	Fine, montmorillonitic, mesic Ustollic Haplargids
Midway	Clayey, montmorillonitic (calcareous), mesic, shallow Ustic Torriorthents
Minnequa	Fine-silty, mixed (calcareous), mesic Ustic Torriorthents
Montez	Fine-loamy, mixed Mollic Paleboralfs
Morop	Fine, montmorillonitic Aridic Argiborolls
Mortenson	Clayey-skeletal, montmorillonitic Typic Paleboralfs
Neville	Fine-loamy, mixed (calcareous), mesic Ustic Torriorthents
Noden	Fine-loamy, mixed, mesic Aridic Argiustolls
Nunn	Fine, montmorillonitic, mesic Aridic Argiustolls
Olney	Fine-loamy, mixed, mesic Ustollic Haplargids
Otero	Coarse-loamy, mixed (calcareous), mesic Ustic Torriorthents
Patent	Fine-loamy, mixed (calcareous), frigid Ustic Torriorthents
Penrose	Loamy, carbonatic, mesic Lithic Ustic Torriorthents
Potts	Fine-loamy, mixed, mesic Ustollic Haplargids
Progresso	Fine-loamy, mixed, mesic Ustollic Haplargids
Razor	Fine, montmorillonitic, mesic Ustollic Camborthids
Ring	Clayey-skeletal, mixed Mollic Eutroboralfs
Rogert	Loamy-skeletal, mixed Lithic Cryoborolls
Schamber	Sandy-skeletal, mixed, mesic Ustic Torriorthents
Tisworth	Fine-loamy, mixed Borollic Natrargids
Tolman	Loamy-skeletal, mixed Lithic Argiborolls
Trag	Fine-loamy, mixed Typic Argiborolls
Travessilla	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Uinta	Fine-loamy, mixed Typic Cryoboralfs
Utica	Sandy-skeletal, carbonatic Typic Calciborolls
Vona	Coarse-loamy, mixed, mesic Ustollic Haplargids
Wahatoya	Loamy-skeletal, mixed, Typic Eutroboralfs
Welring	Loamy-skeletal, carbonatic, mesic Lithic Ustic Torriorthents
Wetmore	Loamy-skeletal, mixed Lithic Eutroboralfs
Wiley	Fine-silty, mixed, mesic Ustollic Haplargids
Willowman	Loamy-skeletal, mixed, mesic Aridic Argiustolls
Woodhall	Loamy-skeletal, mixed Argic Cryoborolls

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