SOIL SURVEY OF

Beaver-Cove Fort Area, Utah

Parts of Beaver and Millard Counties

United States Department of Agriculture
Soil Conservation Service and
United States Department of the Interior
Bureau of Land Management
In cooperation with
Utah Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in the period 1952–63. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1963. This survey was made cooperatively by the Soil Conservation Service, the Utah Agricultural Experiment Station, and the Bureau of Land Management. It is part of the technical assistance furnished to the Beaver, Twin M, and Millard Soil Conservation Districts.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and ranches; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of this survey area are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area, if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the page for the range site in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the range sites and capability groups.

Wildlife managers, and others can find information about soils and wildlife, in the section "Wildlife."

Ranchers and others can find, under "Range," groupings of the soils according to their suitability for range, and also the names of many of the plants that grow on each range site.

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in the survey area may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "Climate."

Cover: Beaver Valley, facing west toward the Mineral Mountains.

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SOIL SURVEY OF BEAVER-COVE FORT AREA, UTAH

PARTS OF BEAVER AND MILLARD COUNTIES

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BEAVER-COVE FORT AREA, UTAH, PARTS OF BEAVER AND MILLARD COUNTIES (called the survey area in this publication) is in the southwestern part of Utah (fig. 1). The eastern boundary of the survey area is the Fishlake National Forest in the Tushar Mountain range; the western boundary is the base of the alluvial fans on the west slope of the Mineral Mountain Range; the southern boundary is the Iron County line; and the northern boundary is in Millard County, 13 miles north of the Beaver County line.

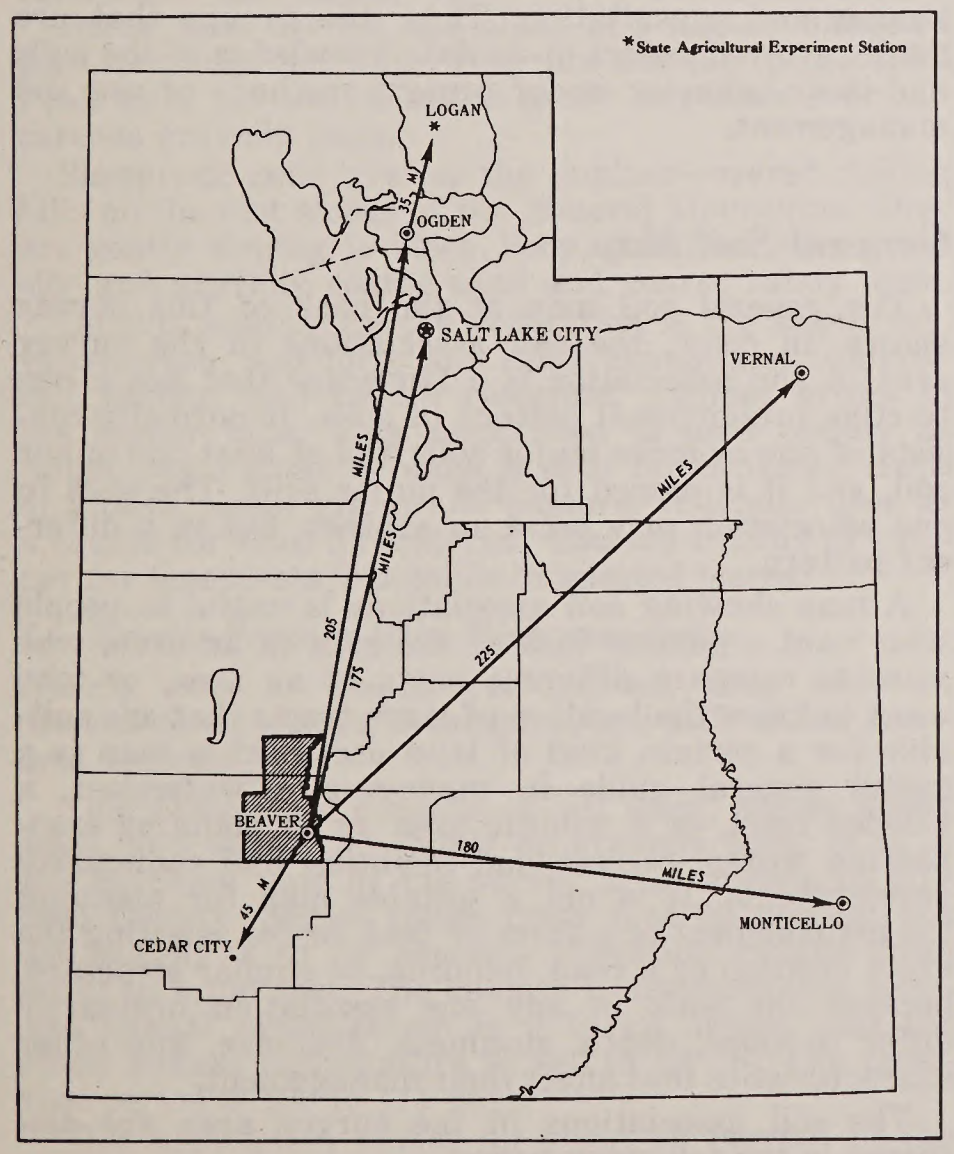

Figure 1.—**Location of Beaver-Cove Fort Area, parts of Beaver and Millard Counties, in Utah.**

The area covers 476,120 acres, or about 744 square miles. About 24,663 acres is used for irrigated general farmland; 5,000 acres is in nonirrigated crops; and the rest is range, wildlife habitat, and water catchment areas.

The area is all in the Beaver River drainage system. The topography ranges from nearly level bottom lands to very steep mountains. Elevation is mainly about 5,200 to 8,000 feet, but some rocky peaks in the Mineral Mountain Range are as much as 9,600 feet high.

Beaver is the county seat of Beaver County and is the largest town in the survey area. Other towns in the survey area are Manderfield, Greenville, Adamsville, and Cove Fort.

Farming is the main source of income.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in the survey area, where they are located, and how they can be used. The soil scientists went into the county knowing they were likely to find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes, the size and speed of streams, the kinds of native plants or crops, the kinds of rock, and many facts about the soils. They dug many holes to expose 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 that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Mineral Mountain and Manderfield, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Manderfield loam, 1 to 3 percent slopes, is one of several phases within the Manderfield series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Two such kinds of mapping units are shown on the soil map of the survey area: soil complexes and soil associations.

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Escalante-Hiko Peak complex, 2 to 10 percent slopes, eroded, is an example.

A soil association is made up of adjacent soils that occur as areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly one from another. The name of an association consists of the names of the dominant soils, joined by a hyphen. Firmage-Oakden association, 5 to 30 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Riverwash is a land type in the survey area.

More detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*5*).[1]

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soil in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, ranchers, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the survey area. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area. or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in the survey area are discussed in the following pages.

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[1] Italic numbers in parentheses refer to Literature Cited, page 137.

1. *Hiko Peak-Decca-Sheeprock association*

Gently sloping to steep, well-drained and somewhat excessively drained, deep soils on alluvial fans, terraces, mountains, and hills of the semiarid uplands

This association consists of gravelly and very gravelly coarse sandy loam, sandy loam, loam, and sandy clay loam. It is in two areas, one between the city of Beaver and the Mineral Mountains, and the other west of the Mineral Mountains north of the Cherry Creek Pass Road. Slopes range from 1 to 50 percent but are mainly 1 to 15 percent. Elevation ranges from 5,300 to 6,800 feet. The climate is semiarid, the average annual precipitation is 9 to 14 inches, and the mean annual temperature is 45° to 49° F. The frost-free period is 100 to 115 days.

This association makes up about 10 percent of the survey area. Hiko Peak soils make up about 40 percent of the association, Decca soils 35 percent, and Sheeprock soils 15 percent. Alovar, Cokel, Escalante, Fruitland, Haybourne, Oasis, Poganeab, and other soils make up the remaining 10 percent.

Hiko Peak soils are on the alluvial fans, hills, and mountains. Their surface layer is coarse sandy loam or loam that, in places, has gravel, cobbles, or stones. The subsoil is loam about 7 inches thick. The underlying material is gravelly loam or gravelly sandy loam to a depth of 30 inches and very gravelly loamy coarse sand below that depth.

Decca soils are on the older and higher dissected fans, terraces and hills. They are similar to the Hiko Peak soils, but the subsoil is sandy clay loam over calcareous gravelly loam.

Sheeprock soils are on the juniper-covered rolling hills on the foot slopes of the Mineral Mountains. They are gently sloping to steep, deep, stratified very gravelly and gravelly coarse sand and coarse sandy loam.

On this association the vegetation is big sagebrush, yellowbrush, and forbs and small amounts of squirreltail, galleta, and Indian ricegrass. Juniper grows in the higher hills. This association is used mainly as range, but a small acreage is used for irrigated crops of alfalfa, small grain, and pasture. It is also used as a source for road fill material. Limited cutting of juniper for fenceposts is possible in selected places.

2. *Kessler-Penoyer-Hiko Peak association*

Nearly level to steep, well-drained, deep soils on alluvial fans, valleys, mountains, and hills of the semiarid uplands

This association consists of silt loam, coarse sandy loam, and loam, and cobbly or gravelly soils. It is in the northern part of the survey area, mainly in Millard County. Slopes range from 1 to 30 percent but are mainly 1 to 20 percent. Elevation ranges from 5,200 to 6,100 feet. The climate is semiarid, the average annual precipitation is 9 to 12 inches, and the mean annual temperature is 48° to 49° F. The frost-free period is 100 to 114 days.

This association makes up about 15 percent of the survey area. Kessler soils make up about 30 percent of the association, Penoyer soils 25 percent, and Hiko Peak soils 20 percent. Antelope Springs, Escalante, Sigurd, and other soils make up the remaining 25 percent.

The Kessler soils are deep and nearly level to steep and are on hills. They are calcareous loam and silt loam throughout. Their surface layer is generally cobbly or very cobbly.

Penoyer soils are deep and gently sloping and are on alluvial fans and valley bottoms. They are silt loam and loam throughout.

Hiko Peak soils are gently sloping to steep and are on alluvial fans, terraces, and hills. Their surface layer is coarse sandy loam or loam that has gravel or cobbles in places. The subsoil is loam about 7 inches thick. The underlying layer, to a depth of 30 inches, is gravelly loam or gravelly sandy loam that is underlain by very gravelly loamy coarse sand.

This association has a cover of vegetation that consists of big sagebrush, yellowbrush, forbs, and shadscale and small amounts of squirreltail, galleta, and Indian ricegrass. In places Penoyer soils have nearly pure stands of shadscale. This association is used as range.

3. *Phage-Ushar-Red Butte association*

Gently sloping to very steep, well-drained and somewhat excessively drained, deep soils on alluvial fans, outwash plains, terraces, hills, and mountains of the dry subhumid uplands

This association consists of sandy loams or clay loams and, in places, cobbly or gravelly soils. It is mostly in the southeastern part of the survey area. Two smaller areas are near the Beaver-Millard County line in Beaver County. Slopes range from 1 to 50 percent. Elevation ranges from 5,900 to 6,800 feet. The climate is dry subhumid, the average annual precipitation is 10 to 14 inches, and the mean annual temperature is 40° to 48° F. The frost-free period is 100 to 108 days.

This association makes up about 26 percent of the survey area. Phage soils make up about 20 percent of the association, Ushar soils 20 percent, and Red Butte soils 15 percent. Deer Creek, Flowell, Manderfield, Murdock, Pavant, Pharo, Mosida, Clegg, Cokel, and other soils make up about 30 percent of the association. Etta, May Day, Pass Canyon, and Rob Roy soils, and Hansel soils, low lime variant, Ushar soils, thick solum variant, and other soils make up the remaining 15 percent.

Phage soils are on terraces, alluvial fans, mountain slopes, and hills. They are deep, calcareous loam, gravelly and very gravelly loam, or sandy loam throughout. In places the top 10 to 12 inches is free of gravel or cobbles.

Ushar soils are deep and are on alluvial fans, outwash plains, and mountains. Their surface layer is loam or sandy loam, which in places is cobbly or very cobbly. Their subsoil is clay loam to a depth of about 20 inches, and loam or sandy loam below that depth.

Red Butte soils are on mountain slopes and hills. Their surface layer is cobbly loam and very cobbly loam. The subsoil is cobbly clay loam, and the substratum is very cobbly sandy loam.

This association has a cover of vegetation that consists of juniper, pinyon, big sagebrush, Gambel oak, bitterbrush, lupine, bluebunch wheatgrass, Indian ricegrass, needleandthread, Sandberg bluegrass, cheatgrass, and forbs. It is used for range and irrigated crops, among which are alfalfa, small grain, and pasture. Limited cutting of juniper for fenceposts is possible in selected areas.

4. *Snake Hollow-Blackett-Blue Star association*

Gently sloping to steep, somewhat excessively drained and well-drained, deep soils on alluvial fans and hills of the dry subhumid uplands

This association consists of coarse sandy loams, sandy loams and, in places, gravelly or cobbly soils. It is on the eastern and western sides of the Mineral Mountain range. Slopes range from 1 to 20 percent but are mainly 1 to 10 percent. Elevation ranges from 6,000 to 6,800 feet. The climate is dry subhumid, the average annual precipitation is 12 to 14 inches, and the mean annual temperature is 45° to 48° F. The frost-free period is 100 to 108 days.

This association makes up about 11 percent of the survey area. Snake Hollow soils make up about 40 percent of the association, Blackett soils 10 percent, and Blue Star soils 10 percent. Phage, Sheeprock, Ushar, and other soils make up the remaining 40 percent.

Snake Hollow soils are on alluvial fans and hills. Their surface layer is coarse sandy loam. The subsoil is coarse sandy loam to light sandy clay loam. The underlying layers are coarse sandy loam to a depth of 35 inches and fine gravel and sand below that depth.

Blackett soils are on alluvial fans. Their surface layer is coarse sandy loam, and their underlying material is coarse sandy loam or light loam. They are calcareous throughout.

Blue Star soils are on alluvial fans. Their surface layer is coarse sandy loam or cobbly sandy loam. Their underlying material is coarse sandy loam to a depth of 20 inches and gravelly coarse sandy loam and gravelly loam below that depth.

This association has a cover of vegetation that consists of juniper, big sagebrush, bitterbrush, bluebunch wheatgrass, Indian ricegrass, needleandthread, and forbs, but much of the vegetation is juniper. This association is used as range. Another use is as a source area for road fill material. The cutting of juniper for fenceposts is possible in selected areas.

5. *Mill Hollow-Ushar-Pharo association*

Gently sloping to steep, well-drained and somewhat excessively drained, deep soils on alluvial fans, terraces, hills, and mountains of the dry subhumid uplands

This association consists of loam and cobbly or very cobbly loams. It is in two areas, one between Pine Creek and Cove Fort and the other near the north-central part of the survey area. Slopes range from 3 to 30 percent. Elevation ranges from 5,900 to 6,800 feet. The climate is dry subhumid, the average annual precipitation is 12 to 14 inches, and the mean annual temperature is 45° to 48° F. The frost-free period is 100 to 108 days.

This association makes up about 5 percent of the survey area. Mill Hollow soils make up about 50 percent of the association, Ushar soils 20 percent, and Pharo soils 15 percent. Black Ridge, Etta, Manderfield, Mosida, Phage, Red Butte, Red Rock and other soils make up the remaining 15 percent.

Mill Hollow soils are on hills and mountains. Their surface layer is dominantly very cobbly loam but, in some places, is cobbly loam or loam. Their underlying material is loam that is extremely stony in some places.

Ushar soils are on alluvial fans. Their surface layer is loam or very cobbly loam. Their subsoil, to a depth of about 20 inches, is heavy loam and light clay loam. The underlying material is loam or coarse sand and gravel.

Pharo soils are on terraces, fans, mountain slopes, and hills. Their surface layer is very cobbly loam or cobbly loam. Their underlying material is very gravelly sandy loam, silt loam, or loam.

This association has a cover of vegetation that consists of juniper, pinyon, big sagebrush, Indian ricegrass, bluebunch wheatgrass, cheatgrass, and forbs. It is used as range. Another use is as a source area for road fill material. The cutting of juniper for fenceposts is possible in selected areas.

6. *Mosida-Etta-Ushar association*

Nearly level to strongly sloping, well-drained, deep soils on alluvial fans and flood plains of the dry subhumid uplands

This association consists of loams. It is in areas near Pine Creek, Cove Fort, Eightmile, and Dog Valley. Elevation ranges from 5,800 to 6,800 feet. The climate is dry subhumid. The average annual precipitation is 12 to 14 inches, and the mean annual temperature is 45° to 48° F. The frost-free period is 100 to 108 days.

The association makes up about 2 percent of the survey area. Mosida soils make up about 40 percent of the association, Etta soils about 20 percent, and Ushar soils about 10 percent. Etta variant, and Fruitland, Flowell, Hiko Peak, Manderfield, Pharo, Red Rock, and other soils make up the remaining 30 percent.

Mosida soils are on alluvial fans and flood plains. Their surface layer is loam, and their underlying layers are loam and silt loam.

Etta soils are on valley fans and flood plains. Their surface layer is loam, and their underlying layers are clay loam.

Ushar soils are mainly on alluvial fans. Their surface layer is loam, and their subsoil, to a depth of about 20 inches, is light clay loam or loam. The underlying material is loam and, at a depth below 36 inches, coarse sand and gravel.

This association has a cover of native vegetation that consists of big sagebrush, western wheatgrass, Indian ricegrass, bitterbrush, and forbs. It is used mainly for nonirrigated crops. Grain is alternated with fallow; many areas are in rye and are grazed by livestock.

A small acreage is irrigated, but water is in short

supply. Seedings of crested wheatgrass have been successful.

7. *Pharo-Pass Canyon association*

Gently sloping to steep, somewhat excessively drained and well-drained, deep to shallow soils on terraces, hills, ridges, and mountains of the dry subhumid uplands

This association consists of gravelly, cobbly, and very cobbly loams and sandy loams. It is in the northeastern and southwestern parts of the survey area. Slopes are mostly 2 to 30 percent. Elevation ranges from 5,900 to 7,000 feet. The climate is dry subhumid, the average annual precipitation is 12 to 17 inches, and the mean annual temperature is 45° to 48° F. The frost-free period is 95 to 108 days.

This association makes up about 11 percent of the survey area. Pharo soils make up about 45 percent of the association, and Pass Canyon soils 25 percent. Kersick, Mud Springs, Pavant, Phage, Rob Roy, Snake Hollow, Ushar, and other soils make up the remaining 30 percent. Rock outcrop is scattered throughout this association.

Pharo soils are on fans, terraces, hills, and mountains. Their surface layer is loam, cobbly loam, gravelly loam, and very cobbly loam. Their underlying material is very gravelly sandy loam, loam, silt loam, or loam.

Pass Canyon soils are on the ridges and mountains. Their surface layer is very cobbly loam, very cobbly sandy loam, and gravelly loam. Their subsoil is heavy sandy clay loam and cobbly clay loam. They are underlain by igneous rock at a depth of 5 to 20 inches.

This association has a cover of vegetation that consists of juniper, pinyon, big sagebrush, bitterbrush, rock goldenrod, cheatgrass, Indian ricegrass, and forbs. It is used mostly as range, but much of it is juniper. Among the other uses are the cutting of juniper for posts and the use of some areas as a source of road fill material.

8. *Shotwell-Firmage-Oakden association*

Moderately sloping to steep, well-drained, very shallow to deep soils on hills and mountains of the semiarid and dry subhumid uplands

This association consists of cobbly and very cobbly soils. It is in three areas in the northwestern part of the survey area, all in Millard County. Slopes range from 5 to 30 percent. Elevation ranges from 5,200 to 6,600 feet. The climate is semiarid and dry subhumid, the average annual precipitation is 9 to 14 inches, and the mean annual temperature 45° to 49° F. The frost-free period is 100 to 115 days.

This association makes up about 2.5 percent of the survey area. Shotwell soils make up about 50 percent of the association, Firmage soils 25 percent, and Oakden soils 10 percent. McQuarrie and other soils and Rock outcrop make up the remaining 15 percent.

Shotwell soils are on mountains. Their surface layer is very cobbly loam. The underlying material is loam that is underlain by bedrock at a depth of 10 to 20 inches. These soils are calcareous throughout.

Firmage soils are on hills and mountains. Their surface layer is very cobbly loam and they are cobbly loam and cobbly sandy loam throughout. Horizons of strong lime accumulation, 40 to 60 inches thick, begin at a depth of 7 to 11 inches.

Oakden soils are mainly on hills. Their surface layer is cobbly loam. The underlying material is loam over a lime-cemented hardpan that is underlain by limestone.

This association has a cover of vegetation that consists of juniper, big sagebrush, yellowbrush, cheatgrass, and very small amounts of Indian ricegrass, squirreltail, and scarlet globemallow. It is used as range.

9. *Black Ridge-Paice association*

Moderately sloping to steep, well-drained, shallow and moderately deep soils on plains and hills of the dry subhumid and moist subhumid uplands

This association consists of cobbly and very cobbly loams and silt loams. It is near the center of the survey area. Slopes range from 3 to 30 percent but are mainly 3 to 15 percent. Elevation ranges from 6,000 to 7,400 feet. The climate is dry subhumid and moist subhumid, the average annual precipitation is 12 to 18 inches, and the mean annual temperature 40° to 48° F. The frost-free period is 80 to 108 days.

This association makes up about 1.5 percent of the survey area. Black Ridge soils make up about 60 percent of the association, and Paice soils 35 percent. Rock outcrop makes up the remaining 5 percent.

Black Ridge soils are on a basalt plain. Their surface layer is a very cobbly silt loam. The subsoil is clay loam and clay underlain at a depth of 14 to 20 inches by a lime-cemented hardpan. Basalt is at a depth of about 36 inches.

Paice soils are on hills. Their surface layer is cobbly loam. Their subsoil is clay loam that is underlain at a depth between 30 and 40 inches by a lime-cemented hardpan.

This association has a cover of vegetation that consists of juniper, Gambel oak, big sagebrush, serviceberry, little needlegrass, slender wheatgrass, and mountain junegrass, but juniper dominates the vegetation over much of the area. Gambel oak, serviceberry, and mountain junegrass are associated with the areas of higher rainfall. This association is used as range.

10. *Clegg-Deer Creek association*

Moderately sloping to very steep, well-drained, deep soils on alluvial fans, hills, and mountains of the moist subhumid uplands

This association consists of cobbly and very cobbly loams and clay loams. It is near the summit in the area north of Manderfield and south of Cove Fort, on both sides of Interstate Highway 15, in the east-central part of the survey area. Slopes range from 3 to 30 percent. Elevation ranges from 6,400 to 7,300 feet. The climate is moist subhumid, the average annual precipitation is 13 to 18 inches, and the mean annual temperature is 40° to 44° F. The frost-free period is 80 to 100 days.

This association makes up about 2 percent of the survey area. Clegg soils make up about 55 percent of

the association, and Deer Creek soils 35 percent. Cokel, Pharo, Rob Roy, Sheeprock, and Ushar soils, the Mineral Mountain gravelly subsoil variant, and other soils make up the remaining 10 percent.

Clegg soils have a surface layer of loam and cobbly loam. Their subsoil is loam and clay loam. The underlying material, at a depth of about 30 inches, is loam and sandy loam.

Deer Creek soils have a surface layer of cobbly or very cobbly loam. The subsoil is cobbly heavy clay loam or cobbly light clay to a depth of about 24 inches. The underlying material is cobbly sandy loam.

This association has a cover of vegetation that consists of big sagebrush, Gambel oak, bitterbrush, lupine, bluebunch wheatgrass, Sandberg bluegrass, and a few pinyon and juniper. It is used as range.

11. Yardley-Maple Mountain-Wallsburg association

Gently sloping to very steep, well-drained, deep to shallow soils on alluvial fans, ridges, and mountain side slopes and in mountain valleys of the moist subhumid uplands

This association consists of cobbly or very cobbly loam and loam. It is north of Manderfield and south of Cove Fort and 2 to 5 miles west of Interstate Highway 15. Slopes range from 1 to 60 percent. Elevation ranges from 6,700 to 8,000 feet. The climate is moist subhumid, the average annual precipitation is 18 to 20 inches, and the main annual temperature is 39° to 40° F. The frost-free period is 65 to 90 days.

This association makes up about 2 percent of the survey area. Yardley soils make up about 50 percent of the association, Maple Mountain soils 25 percent, and Wallsburg soils 15 percent. Among the soils that make up the remaining 10 percent are variants of Mineral Mountain soils.

Yardley soils are on alluvial fans, on mountain side slopes, and in small mountain valleys. They have a surface layer of loam, a subsoil of heavy clay loam, and a substratum of heavy loam. They are noncalcareous throughout.

Maple Mountain soils are on mountain side slopes. They have a surface layer of cobbly loam, a subsoil of cobbly clay loam, and a substratum of sandy clay loam. They are noncalcareous throughout.

Wallsburg soils are on the ridges and mountain side slopes. They have a surface layer of very cobbly loam and a subsoil of very cobbly clay and are underlain by fractured bedrock at a depth of 10 to 20 inches. They are noncalcareous throughout.

This association has a cover of vegetation that consists of Gambel oak, big sagebrush, bitterbrush, snowberry, tall native poa, bluebunch wheatgrass, lupine, cheatgrass, mountainmahogany, and forbs. It is used as range.

12. Rock land-Bearskin-Cowers association

Rock land and gently sloping to very steep, well-drained, shallow to deep soils on ridges, hills, and mountains of the moist subhumid mountains

This association consists of sandy loams and gravelly coarse sandy loams. It is in the Mineral Mountain Range, northwest of Beaver. Slopes range from 2 to 60 percent but are mainly 5 to 30 percent. Elevation ranges from 6,800 to 7,800 feet. The climate is moist subhumid, the average annual precipitation is 16 to 20 inches, and the mean annual temperature is 39° to 43° F. The frost-free period is 65 to 100 days.

This association makes up about 11 percent of the survey area. Rock land and Rock outcrop make up about 40 percent of the association, Bearskin soils 20 percent, and Cowers soils 20 percent. May Day, Maple Mountain, McQuarrie variant, Mineral Mountain, Pass Canyon, Snake Hollow, and Wallsburg, and other soils make up the remaining 20 percent.

Rock land and Rock outcrop are on the mountain side slopes.

Bearskin soils are mostly on the mountain ridges. They have a surface layer of sandy loam and a subsoil, to a depth of 10 to 20 inches, of fine gravelly sandy clay loam. The underlying material is weathering granite.

Cowers soils are on mountain slopes. They have a surface layer of coarse sandy loam, a subsoil of loam and gravelly sandy loam, and a substratum of gravelly sandy loam.

This association has a cover of vegetation that consists of mountainmahogany, Gambel oak, big sagebrush, bitterbrush, snowberry, tall native poa, and bluebunch wheatgrass. A considerable amount of the area supports very little or no vegetation. This association is used for range, mining, watershed catchment, and recreation.

13. James Canyon-Draper-Poganeab association

Gently sloping, poorly drained and somewhat poorly drained, deep soils on flood plains, fans, and terraces in semiarid and dry subhumid valleys

This association consists of loams. It is along the Beaver River from Beaver to Adamsville. Slopes range from 1 to 3 percent. Elevation ranges from 5,700 to 6,000 feet. The climate is semi-arid and dry subhumid, the average annual precipitation is 10 to 13 inches, and the mean annual temperature is 45° to 48° F. The frost-free period is 100 to 115 days.

The association makes up about 2 percent of the survey area. James Canyon soils make up about 35 percent of the association, Draper soils, 20 percent, Poganeab soils, 15 percent, and Wet alluvial land, 15 percent. Chipman, and Manderfield, and other soils make up the remaining 15 percent.

James Canyon soils are poorly drained. Their surface layer is dark-gray silt loam, and the underlying material is silt loam or sandy loam. The water table is generally above a depth of 20 inches.

Draper soils are somewhat poorly drained. Their surface layer is dark grayish-brown loam, and their first underlying layer is loam and very fine sandy loam. The underlying material is gravel and sand. The water table is generally between depths of 30 to 40 inches.

Poganeab soils are poorly drained. The surface layer is dark grayish brown clay loam and loam and the underlying material is clay loam and silty clay

loam. The water table is generally above a depth of 20 inches.

This association has a cover of vegetation that is mainly meadow grasses, clovers, and sedges. It is used mainly for meadow hay and pasture. Some of the better drained areas are cultivated and are used for small grain and alfalfa. In places where irrigation water is adequate, additional areas can be cultivated.

Descriptions of the Soils

This section describes the soil series and mapping units in the survey area. Each soil series is described in considerable detail, and then, briefly, each mapping unit in that series. Unless it is specifically mentioned otherwise, it is to be assumed that what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second, detailed and in technical terms, is for scientists, engineers, and others who need to make thorough and precise studies of soils. Unless it is otherwise stated, the colors given in the descriptions are those of a dry soil.

As mentioned in the section "How This Survey Was Made," not all mapping units are in a soil series. Rock land, for example, does not belong to a soil series, but nevertheless is listed in alphabetic order along with the soil series.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and range site in which the mapping unit has been placed. The page for the description of each capability unit and range site can be found by referring to the "Guide to Mapping Units" at the back of this survey.

The mapping units in this survey are not all of equal intensity, or degree of precision. Mapping units in parts of the survey area that are cultivated, or mostly cultivated, contain less than 20 percent of soils other than those shown in the name of the unit.

In the tracts not cultivated, a mapping unit that has slopes of less than 3 percent includes few areas of other soils, unless it is a unit that occurs where deep soils are adjacent to moderately deep or shallow soils. Boundaries of mapping units that are eroded or range widely in slope are less precise.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary at the back of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*5*).

Alovar Series

The Alovar series consists of deep, moderately sloping to strongly sloping, well-drained soils. These soils formed in alluvium derived from shale. Alovar soils are east of Indian Creek and west of Manderfield. Elevation ranges from 5,700 to 6.200 feet. Mean annual air temperature is 48° to 49° F, average annual precipitation is 11 to 12 inches, and the frost-free period is 105 to 115 days. The vegetation is black sagebrush, big sagebrush, greasewood, shadscale, and winterfat.

In a representative profile the surface layer is light brownish-gray loam about 6 inches thick. The upper 32 inches of the underlying material is light brownish-gray, friable clay loam and light-gray, friable silty clay loam. The lower 22 inches is light-gray, friable clay loam.

The available water capacity is 10 to 12 inches in a 5-foot profile, and the water-supplying capacity is 6 to 9 inches. Permeability is moderately slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, watershed catchment, and wildlife habitat. Brush management and range seeding practices are not well suited to these soils because rainfall is low.

Representative profile of Alovar loam, 3 to 10 percent slopes, severely eroded, 2½ miles west of Manderfield, ¼ mile south and ⅜ mile west of the northwest corner of sec. 19, T. 28 S., R. 8 W.

A1—0 to 6 inches, light brownish-gray (2.5Y 6/2) loam, dark grayish brown (2.5Y 4/2) when moist; weak, thin, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; few, fine and medium, vesicular pores; strongly calcareous; moderately alkaline (pH 8.2); clear, smooth boundary.

C1—6 to 18 inches, light brownish-gray (2.5Y 6/2) clay loam, grayish brown (2.5Y 5/2) when moist; massive; hard, friable slightly sticky and slightly plastic; few fine and medium roots; common, fine and medium, tubular pores; strongly calcareous; moderately alkaline (pH 8/4); gradual, wavy boundary.

C2—18 to 38 inches, light-gray (5Y 7/2) silty clay loam, olive gray (5Y 5/2) when moist; very weak, coarse, blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few fine, medium, and coarse, tubular pores; strongly calcareous; strongly alkaline (pH 8.7); gradual, smooth boundary.

C3—38 to 60 inches, light-gray (5Y 7/2) clay loam, olive (5Y 5/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; very few fine roots; few, fine, tubular pores; strongly calcareous; strongly alkaline (pH 8.5).

The A1 horizon is 4 to 8 inches thick. The A1 and C horizons have hues of 2.5Y or 5Y, values of 6 or 7 when dry and 4 or 5 when moist, and chromas of 2 or 3. The C horizon is silt loam, silty clay loam, or clay loam.

Alovar loam, 3 to 10 percent slopes, severely eroded (ALD3).—Areas of this soil have shallow gullies, 200 to 400 feet apart, that commonly drain into gullies that are 20 to 30 feet deep and 30 to 50 feet wide. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIIe–S, nonirrigated; Semidesert Silt Loam range site.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soils	Area	Extent
	Acres	*Percent*
Alovar loam, 3 to 10 percent slopes, severely eroded	3,585	0.7
Antelope Springs-Kessler association, 1 to 10 percent slopes, eroded	3,345	.7
Antelope Springs silt loam, low lime subsoil variant	670	.1
Bearskin-Cowers very rocky association, 2 to 30 percent slopes, eroded	2,745	.6
Bearskin-Cowers extremely rocky association, 2 to 30 percent slopes	5,580	1.2
Blackett coarse sandy loam, 3 to 20 percent slopes	690	.1
Blackett-Blue Star association, 3 to 20 percent slopes	1,600	.3
Blackett-Snake Hollow association, 3 to 20 percent slopes, eroded	5,150	1.1
Black Ridge extremely rocky silt loam, 6 to 30 percent slopes	3,835	.8
Blue Star cobbly sandy loam, 3 to 10 percent slopes	3,460	.7
Chipman silty clay loam	650	.1
Clegg loam, 6 to 30 percent slopes	4,970	1.0
Clegg cobbly loam, 6 to 30 percent slopes	2,960	.6
Clegg very rocky loam, 6 to 30 percent slopes	365	.1
Cokel coarse sandy loam, 3 to 15 percent slopes	3,525	.7
Colluvial land and Shale outcrop	2,080	.4
Cowers coarse sandy loam, 2 to 30 percent slopes, eroded	355	.1
Cowers association, 2 to 30 percent slopes, eroded	2,470	.5
Cowers-Bearskin association, 2 to 30 percent slopes, eroded	6,995	1.5
Decca gravelly sandy loam, 3 to 6 percent slopes	885	.2
Decca cobbly sandy loam, 10 to 30 percent slopes	295	.1
Decca loam, 1 to 3 percent slopes	8,385	1.8
Decca loam, 3 to 6 percent slopes	1,740	.4
Decca very rocky loam, 2 to 10 percent slopes	265	.1
Decca-Hiko Peak complex, 1 to 30 percent slopes	4,960	1.0
Deer Creek cobbly loam, 3 to 30 percent slopes, eroded	2,890	.6
Deer Creek very cobbly loam, 3 to 20 percent slopes, eroded	4,595	1.0
Draper loam, 1 to 3 percent slopes	365	.1
Draper loam, sandy subsoil variant	1,320	.3
Escalante sandy loam, 2 to 10 percent slopes, eroded	6,310	1.3
Escalante-Hiko Peak complex, 2 to 10 percent slopes, eroded	4,820	1.0
Etta loam	2,780	.6
Etta clay, heavy variant	1,415	.3
Firmage-Oakden association, 5 to 30 percent slopes	4,485	.9
Flowell loam, 3 to 6 percent slopes, eroded	390	.1
Flowell gravelly loam, 3 to 6 percent slopes, eroded	2,250	.5
Flowell association, 1 to 3 percent slopes	410	.1
Flowell association, 3 to 6 percent slopes, eroded	2,280	.6
Flowell-Ushar association, 3 to 30 percent slopes	3,040	.6
Flowell loam, cold variant, 10 to 30 percent slopes, eroded	355	.1
Flowell cobbly loam, cold variant, 30 to 60 percent slopes, eroded	800	.2
Fruitland loam, 1 to 3 percent slopes	630	.1
Fruitland loam, 3 to 6 percent slopes	1,090	.2
Fruitland loam, 1 to 6 percent slopes, eroded	1,455	.3
Hansel loam, 1 to 3 percent slopes	540	.1
Hansel silt loam, low lime variant	1,260	.3
Haybourne coarse sandy loam, 1 to 10 percent slopes	5,075	1.1
Hiko Peak coarse sandy loam, 3 to 30 percent slopes	3,790	.8
Hiko Peak cobbly loam, 2 to 10 percent slopes	10,485	2.2
Hiko Peak-Decca association, 1 to 15 percent slopes	6,455	1.4
Hiko Peak-Fruitland association, 1 to 15 percent slopes	4,510	1.0
James Canyon silt loam, 1 to 3 percent slopes	870	.2
James Canyon silt loam, strongly saline, 1 to 3 percent slopes	505	.1
James Canyon loam, calcareous variant	1,005	.2
James Canyon silty clay loam, heavy variant	200	(1)
James Canyon silty clay loam, heavy variant, saline	265	.1
Kersick very rocky loam, 5 to 30 percent slopes	1,865	.4
Kessler loam, 1 to 10 percent slopes	2,730	.6
Kessler cobbly loam, 3 to 20 percent slopes	6,200	1.3
Kessler-Hiko Peak association, 1 to 20 percent slopes	5,150	1.1
Kessler-Penoyer association, 1 to 20 percent slopes	12,650	2.7
Manderfield loam, 1 to 3 percent slopes	6,485	1.4
Manderfield loam, 3 to 6 percent slopes	455	.1
Manderfield loam, 1 to 3 percent slopes, eroded	1,190	.3
Manderfield loam, moderately deep over gravel, 1 to 3 percent slopes	435	.1
Manderfield gravelly loam, 1 to 3 percent slopes	1,100	.2
Manderfield cobbly loam, 1 to 6 percent slopes	275	.1
Manderfield cobbly loam, 1 to 6 percent slopes, eroded	1,030	.2
Maple Mountain cobbly loam, 25 to 50 percent slopes	980	.2
May Day association, 10 to 60 percent slopes	1,680	.4
May Day-Deer Creek association, 3 to 20 percent slopes	1,900	.4
McQuarrie rocky loam, 2 to 30 percent slopes	1,865	.4
McQuarrie very cobbly loam, coarse-textured subsoil variant, 5 to 30 percent slopes	425	.1
Mill Hollow very cobbly loam, 2 to 10 percent slopes	2,330	.5
Mill Hollow-Pharo association, 2 to 30 percent slopes	10,920	2.3
Mill Hollow-Ushar association, 3 to 30 percent slopes	2,255	.5
Mineral Mountain extremely rocky loam, 30 to 60 percent slopes	8,970	1.9
Mineral Mountain-Snake Hollow association, 3 to 60 percent slopes, eroded	6,525	1.4
Mineral Mountain very cobbly loam, gravelly subsoil variant, 2 to 20 percent slopes	780	.2
Mineral Mountain very cobbly loam, gravelly subsoil variant, 40 to 60 percent slopes, eroded	355	.1
Mine wash	380	.1
Mosida loam, 1 to 3 percent slopes	845	.2
Mosida loam, 3 to 6 percent slopes	235	.1
Mosida loam, 1 to 6 percent slopes, eroded	4,195	.9
Mosida loam, 1 to 6 percent slopes, severely eroded	2,410	.5
Mosida loam, gravelly substratum, 1 to 6 percent slopes	1,575	.3
Mud Springs extremely rocky coarse sandy loam, 30 to 40 percent slopes	3,085	.6
Murdock silt loam, 1 to 3 percent slopes	6,810	1.4
Murdock-Flowell association, 1 to 30 percent slopes, eroded	710	.1
Oasis loam, 1 to 3 percent slopes	320	.1
Paice cobbly loam, 3 to 10 percent slopes	2,660	.6
Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, severely eroded	1,160	.2

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soils	Area	Extent
	Acres	*Percent*
Pass Canyon very rocky coarse sandy loam, 5 to 30 percent slopes, eroded	11,505	2.4
Pavant silt loam, 1 to 3 percent slopes	375	.1
Pavant cobbly loam, 1 to 6 percent slopes	740	.2
Pavant extremely rocky loam, 30 to 40 percent slopes	1,685	.3
Penoyer silt loam, 1 to 3 percent slopes	10,005	2.1
Penoyer-Hiko Peak association, 1 to 10 percent slopes	710	.1
Phage loam, 3 to 10 percent slopes, eroded	470	.1
Phage gravelly loam, 3 to 10 percent slopes, eroded	615	.1
Phage cobbly loam, 3 to 30 percent slopes, eroded	3,935	.8
Phage cobbly loam, 30 to 50 percent slopes, eroded	3,020	.6
Phage very cobbly loam, 3 to 30 percent slopes, eroded	995	.2
Phage very rocky loam, 30 to 60 percent slopes, eroded	15,660	3.3
Phage-Black Ridge association, 3 to 30 percent slopes, eroded	3,005	.6
Phage-Pass Canyon association, 3 to 30 percent slopes, eroded	1,550	.3
Phage-Red Butte association, 3 to 30 percent slopes, eroded	3,765	.8
Phage-Ushar complex, 3 to 30 percent slopes, eroded	10,455	2.2
Pharo loam, 1 to 3 percent slopes	1,875	.4
Pharo loam, 3 to 10 percent slopes	2,120	.4
Pharo loam, 3 to 10 percent slopes, eroded	580	.1
Pharo very cobbly loam, 3 to 30 percent slopes	9,250	1.9
Pharo-Ushar association, 3 to 30 percent slopes, eroded	1,145	.2
Poganeab clay loam, 1 to 3 percent slopes	1,000	.2
Poganeab clay loam, deep over clay, 1 to 3 percent slopes	380	.1
Red Butte very cobbly loam, 3 to 50 percent slopes, eroded	1,530	.3
Red Butte very rocky loam, 30 to 50 percent slopes, eroded	1,415	.3
Red Butte association, 3 to 60 percent slopes, eroded	720	.1
Red Butte-Deer Creek association, 30 to 50 percent slopes, eroded	18,885	4.0
Red Butte-Flowell association, 3 to 30 percent slopes, eroded	810	.2
Red Butte-Phage association, 3 to 30 percent slopes, eroded	2,800	.6
Red Rock silt loam, 1 to 3 percent slopes	1,850	.4
Riverwash	1,020	.2
Rob Roy loam, 1 to 15 percent slopes	500	.1
Rob Roy very cobbly loam, 10 to 30 percent slopes	730	.1
Rob Roy very rocky loam, 10 to 30 percent slopes	995	.2
Rock land	18,180	3.8
Sheeprock coarse sandy loam, 2 to 6 percent slopes	925	.2
Sheeprock gravelly coarse sandy loam, 10 to 25 percent slopes	2,330	0.5
Sheeprock-Cokel complex, 3 to 30 percent slopes	8,175	1.7
Sheeprock-Ushar complex, 3 to 30 percent slopes	2,085	.4
Shotwell very rocky loam, 10 to 30 percent slopes	5,310	1.1
Sigurd gravelly loam, 3 to 15 percent slopes	2,800	.6
Snake Hollow coarse sandy loam, 3 to 10 percent slopes	14,175	3.0
Snake Hollow coarse sandy loam, 3 to 10 percent slopes, eroded	2,055	.4
Snake Hollow-Blackett association, 3 to 20 percent slopes, severely eroded	2,000	.4
Snake Hollow-Blue Star association, 3 to 10 percent slopes	955	.2
Snake Hollow very rocky loam, gravelly subsoil variant, 10 to 30 percent slopes	1,030	.2
Ushar sandy loam, 3 to 10 percent slopes, eroded	3,415	.7
Ushar loam, 1 to 6 percent slopes, severely eroded	2,370	.5
Ushar loam, 3 to 10 percent slopes	3,605	.8
Ushar loam, 3 to 10 percent slopes, eroded	2,750	.6
Ushar cobbly loam, 3 to 30 percent slopes, eroded	1,440	.3
Ushar rocky loam, 5 to 30 percent slopes, eroded	500	.1
Ushar-Etta association, 3 to 10 percent slopes	335	.1
Ushar-Mill Hollow association, 1 to 10 percent slopes, eroded	1,840	.4
Ushar-Mill Hollow association, 10 to 30 percent slopes, eroded	5,240	1.1
Ushar-Mosida association, 3 to 30 percent slopes	2,810	.6
Ushar-Murdock association, 3 to 25 percent slopes	315	.1
Ushar-Phage association, 3 to 30 percent slopes, eroded	3,295	.7
Ushar-Phage association, 30 to 70 percent slopes, eroded	845	.2
Wallsburg very cobbly loam, 30 to 60 percent slopes, eroded	925	.2
Wallsburg association, 30 to 60 percent slopes, eroded	710	.1
Wallsburg-Maple Mountain association, 3 to 60 percent slopes, eroded	9,685	2.0
Wet alluvial land	1,315	.3
Yardley loam, 1 to 6 percent slopes	3,045	.6
Yardley-Maple Mountain association, 1 to 25 percent slopes	3,020	.6
Yardley-Wallsburg association, 3 to 30 percent slopes	810	.2
Total	476,120	100.0

[1] Less than 0.05 percent.

Antelope Springs Series

The Antelope Springs series consists of deep, gently sloping, well-drained soils that are strongly affected by salts and alkali. These soils are in alluvial valleys, on fans, and on flood plains. They formed in alluvium derived from mixed material. Antelope Springs soils are in the area near Antelope Springs and Government Pass. They are associated with Kessler soils. Elevation ranges from 5,400 to 6,000 feet. Mean annual air temperature is 48° to 49° F, average annual precipitation is 9 to 12 inches, and the frost-free period is 105 to 115 days. The vegetation is predominantly shadscale.

In a representative profile the surface layer is

light-gray loam about 2 inches thick. The subsoil is pale-brown, friable clay loam about 7 inches thick. The upper 12 inches of the underlying material is very pale brown or white, friable loam that is very strongly calcareous, and the lower 39 inches is very pale brown, friable fine sandy loam.

Antelope Springs soils are moderately eroded. Available water capacity is about 7 inches in a 5-foot profile, and the water supplying capacity is 4 to 6 inches because the soils have a high content of salts and alkali. Permeability is slow. Roots of suited species can penetrate to a depth of 60 inches or more.

These soils are used for range and wildlife. They are not suited to clearing and range seeding because their content of salts is high and rainfall is low.

They are mapped only in an association with Kessler soils.

Representative profile of Antelope Springs loam, 1 to 3 percent slopes, eroded, in an area of Antelope Springs-Kessler association, 1 to 10 percent slopes, eroded, 1 mile north of Antelope Point, 0.4 mile north from southeast corner of sec. 2, T. 25 S., R. 9 W.:

A2—0 to 2 inches, light-gray (10Y 7/2) loam, dark grayish brown (10YR 4/2) when moist; moderate, thin, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; many, fine and medium, vesicular pores; few fine roots; slightly calcareous; strongly alkaline (pH 8.9); abrupt, smooth boundary.

B1—2 to 4 inches, light brownish-gray (10YR 6/2) loam, brown to dark brown (10YR 4/3) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and plastic; few, fine and medium, tubular pores; few fine and medium roots; noncalcareous; strongly alkaline (pH 8.6); clear, smooth boundary.

B2t—4 to 9 inches, pale-brown (10YR 6/3) clay loam, brown to dark brown (10YR 4/3) when moist; moderate, medium, subangular blocky structure that parts to moderate, fine, subangular blocky; hard, friable, slightly sticky and plastic; few, fine and medium, tubular pores; few fine and medium roots; thin, continuous clay films; slightly calcareous; moderately alkaline (pH 8.4); clear, smooth boundary.

C1ca—9 to 13 inches, very pale brown (10YR 7/3) loam, pale brown (10YR 6/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; few, fine, tubular pores; few fine roots; very strongly calcareous; moderately alkaline (pH 8.4); clear, wavy boundary.

C2ca—13 to 21 inches, white (10YR 8/1) loam, light gray (10YR 7/2) when moist; massive; hard, friable, slightly sticky and slightly plastic; few, fine, tubular pores; very few fine roots; very strongly calcareous; moderately alkaline (pH 8.2); gradual, wavy boundary.

C3—21 to 60 inches, very pale brown (10YR 7/3) fine sandy loam, brown (10YR 5/3) when moist; massive; hard, friable, slightly sticky and nonplastic; few, fine, tubular pores; no roots; strongly calcareous; moderately alkaline (pH 8.4).

The A2 horizon is 1 to 4 inches thick. It has color hue of 10YR or 7.5YR, value of 6 or 7 when dry and 3 or 4 when moist, and chroma of 2 or 3. The B2t horizon ranges from heavy loam to sandy clay loam or clay loam. It has color hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 when moist, and chroma of 3 or 4. This horizon is 4 to 8 inches thick. The combined A and B horizons are 8 to 18 inches thick. The ca horizon begins just under the B horizon and is 12 to 30 inches thick. The C horizon is loam to loamy sand.

Antelope Springs-Kessler association, 1 to 10 percent slopes, eroded (AND2).—This mapping unit consists of about 55 percent Antelope Springs loam, 1 to 3 percent slopes, eroded, and 30 percent Kessler gravelly loam, 1 to 10 percent slopes, eroded. Included with these soils in mapping are Penoyer silt loam, 1 to 3 percent slopes, Hiko Peak cobbly loam, 2 to 10 percent slopes, and Rock outcrop. Each of these inclusions makes up about 5 percent of the acreage. In places the Kessler soil has slopes of more than 10 percent.

The Antelope Springs soil has the profile described as representative of the Antelope Springs series. The Kessler soil has a profile similar to the one described as representative of the Kessler series, but its surface layer is gravelly and more eroded. Runoff is medium, and the hazard of erosion is moderate.

The vegetation is dominantly shadscale on the Antelope Springs soil and big sagebrush on the other soils. This mapping unit is used only for range. Antelope Springs soil—capability unit VIIs–S8, nonirrigated; Semidesert Alkali Flats range site, Kessler soil—capability unit VIIe–S, nonirrigated; Semidesert Limy Loam range site.

Antelope Springs Variant

The Antelope Springs variant consists of deep, nearly level, moderately well drained, strongly saline-alkali soils. These soils are on flood plains and at the lower end of alluvial fans. They formed in alluvium derived from igneous and sedimentary materials. Antelope Springs variant soils, are along the Beaver River south and west of Greenville. Elevation ranges from 5,700 to 5,900 feet. Mean annual air temperature is 48° to 49° F. average annual precipitation is 10 to 12 inches, and the frost-free period is 100 to 108 days. The vegetation is greasewood and saltgrass.

In a representative profile the surface layer is light-gray and pale-brown silt loam and loam about 4 inches thick. The subsoil is light-brown very firm clay loam about 10 inches thick. The underlying material is stratified light-brown to pinkish-gray, slightly calcareous sandy loam to clay loam.

Soils of the Antelope Springs variant are slightly eroded. The available water capacity is 7 to 8 inches in a 5-foot profile, and the water supplying capacity is 4 to 6 inches because of the salts and alkali. Permeability is slow. Roots of suited species can penetrate to a depth of 60 inches or more. Natural fertility is low, and erodibility is high. In some years a water table is between depths of 40 to 60 inches.

These soils are used mainly for range, watershed catchment, and wildlife habitat. They are not suited to clearing and range seeding because precipitation is low and the salt content of the soils is high.

Representative profile of Antelope Springs silt loam, low lime subsoil variant, 5/8 mile west of Greenville and 600 feet south from road, NE1/4SW1/4 sec. 26, T. 29 S., R. 8 W.

A21—0 to ¾ inch, light-gray (10YR 7/2) silt loam, brown to dark brown (10YR 4/3) when moist; moderate, very thin, platy structure; slightly hard, friable, nonsticky and nonplastic; no roots; many vesicular pores; moderately calcareous; very strongly alkaline (pH 9.6); abrupt, wavy boundary.

A22—¾ to 1½ inches, pale-brown (10YR 6/3) silt loam, brown to dark brown (10YR 4/3) when moist; weak, medium, platy structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; vesicular pores; moderately calcareous; very strongly alkaline (pH 9.7); abrupt, wavy boundary.

A2B2—1½ to 4 inches, pale-brown (10YR 6/3) loam, dark brown to brown (10YR 4/3) when moist; weak, medium, prismatic structure that parts to weak, thick, platy; hard, firm, sticky and plastic; common fine and medium roots; few, fine, tubular pores; moderately calcareous; very strongly alkaline (pH 9.6); abrupt, wavy boundary.

B21t—4 to 7 inches, light-brown (7.5YR 6/3) clay loam, dark brown to brown (7.5YR 5/3) when moist; weak, medium, prismatic structure that parts to moderate, very fine, angular blocky; very hard, very firm, sticky and plastic; common fine roots; few, fine, tubular pores; thin, patchy clay films; moderately calcareous; very strongly alkaline (pH 10.0); gradual, wavy boundary.

B22t—7 to 14 inches, light-brown (7.5YR 6/3) clay loam, brown to dark brown (7.5YR 4/3) when moist; weak, medium, prismatic structure that parts to moderate, medium, angular blocky; very hard, very firm, sticky and plastic; common fine roots; few fine pores; thin, patchy clay films; moderately calcareous; very strongly alkaline (pH 10.0); clear, wavy boundary.

C1—14 to 32 inches, light-brown (7.5YR 6/3) sandy loam, brown to dark brown (7.5YR 4/3) when moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots and pores; slightly calcareous; strongly alkaline (pH 8.8); clear, wavy boundary.

IIC2—32 to 40 inches, pinkish-gray (7.5YR 6/2) clay loam, dark brown to brown (7.5YR 4/3) when moist; massive; few, fine, faint, brown (7.5YR 5/4) mottles; very hard, very firm, very sticky and very plastic; few fine roots; no pores; slightly calcareous; strongly alkaline (pH 8.5); abrupt, smooth boundary.

IIIC3—40 to 60 inches, pinkish-gray (7.5YR 6/2) loam, dark brown to brown (7.5YR 4/3) when moist; massive; few to common, medium, distinct, yellowish-brown (10YR 5/6) mottles; slightly sticky and slightly plastic; no roots; no pores; noncalcareous; moderately alkaline (pH 8.2).

In some places, the A2 horizon is a thin crust, but in others it is as much as 3 inches thick. It is thicker under a protective plant cover and thinner between the plants in slick spots. This horizon has color value of 6 or 7 when dry and 4 or 5 when moist and chroma of 2 or 3. The B2t horizon is silty clay loam to clay loam. It has color hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 through 4. In places faint mottling occurs between depths of 24 to 40 inches, and in places distinct mottles occur below a depth of 40 inches. Below the B2t horizon, strata that range from sandy loam to clay are common. Exchangeable sodium is dominantly more than 50 percent but is variable throughout the profile.

Antelope Springs silt loam, low lime subsoil variant (AS).—This soil is strongly affected by salts, and consequently the water available for plants is reduced by 30 to 60 percent. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIIs–S8, nonirrigated; Semidesert Alkali Flats range site.

Bearskin Series

The Bearskin series consists of shallow, gently sloping to steep well-drained soils that formed in residuum derived from granite. These soils are on mountain ridges and a few side slopes. Bearskin soils are throughout the Mineral Mountains, mainly at a higher elevation. They are associated with Cowers soils and Rock outcrop. Elevation ranges from 6,800 to 7,800 feet. Mean annual air temperature is 39° to 40° F, average annual precipitation is 16 to 20 inches, and the frost-free period is 65 to 85 days. The vegetation is mountainmahogany, big sagebrush, Gambel oak, and bluebunch wheatgrass.

In a representative profile the surface layer is dark grayish-brown, sandy loam about 5 inches thick. The subsoil is dark grayish-brown, friable fine gravelly sandy clay loam. It is underlain, at a depth of 10 inches, by weathering granite.

Bearskin soils are moderately eroded. The available water capacity is about 2 to 4 inches, and the water supplying capacity is about 5 to 9 inches. Permeability is moderate. Roots can penetrate to a depth of 10 to 18 inches.

These soils are used for range, wildlife habitat, and watershed catchment. They are not suitable for clearing and range seeding because they are steep and shallow. Range vegetation can be improved by management practices.

Representative profile of Bearskin coarse sandy loam, 2 to 30 percent slopes, eroded, in an area of Bearskin-Cowers very rocky association, 2 to 30 percent slopes, eroded, 8 miles north and 8 miles west of Manderfield, NW¼NW¼ sec. 8, T. 27 S., R. 8 W.

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) coarse sandy loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; soft, friable, slightly sticky and slightly plastic; few medium and fine roots; few, fine, tubular pores; slightly acid (pH 6.2); clear, smooth boundary.

B2t—5 to 10 inches, dark grayish-brown (10YR 4/2) fine gravelly sandy clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; very few medium and fine roots; few, fine, tubular pores; thin, continuous clay films; slightly acid (pH 6.2); gradual, wavy boundary.

C—10 to 18 inches, weathering granite.

R—18 inches, granite.

The A and B horizons are 10 to 20 inches thick over granite. The A1 horizon is 4 to 7 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 2. The B2t horizon is gravelly sandy clay loam or sandy clay loam 5 to 14 inches thick, and it is less than 50 percent gravel. It has color hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 when moist, and chroma of 2 or 3.

Bearskin-Cowers very rocky association, 2 to 30 percent slopes, eroded (BCF2).—This mapping unit is 50 percent Bearskin coarse sandy loam, 2 to 30 percent slopes, eroded; 35 percent Cowers coarse sandy loam, 2 to 30 percent slopes; and 15 percent Rock outcrop. Included were small areas of Cowers soils that have slopes of 40 percent. The Bearskin soil is dominantly on ridges, but a few areas are on mountain side slopes. The Cowers soil is on mountain side slopes. Rock outcrop occurs in association with the Bearskin soil.

Both soils in this association have the profiles described as representative for their series. Runoff is rapid, and the hazard of erosion is high.

This mapping unit is used for range, wildlife habitat, and watershed catchment. Cowers soils are suitable for range seeding, but careful control of erosion is needed. Bearskin soil—capability unit VIIs–M, nonirrigated; Mountain Shallow Loam range site; Cowers soil—capability unit VIe–M, nonirrigated, Mountain Gravelly Loam range site; Rock outcrop—capability unit VIIIs–X.

Bearskin-Cowers extremely rocky association, 2 to 30 percent slopes (BEF).—This mapping unit is 35 percent Bearskin coarse sandy loam, 2 to 30 percent slopes, eroded; 20 percent Cowers coarse sandy loam, 2 to 30 percent slopes, eroded; and 45 percent Rock outcrop.

The Cowers soil has a profile similar to the one described as representative of the series, but the dark-colored surface layer is 10 inches thinner. The proportion of Rock outcrop is greater than that in areas of Bearskin-Cowers very rocky association. Runoff is rapid, and the hazard of erosion is high.

This mapping unit is used for range, watershed catchment, and wildlife. Only the Cowers soil can be cleared and seeded for range if such practices are needed. Bearskin soil—capability unit VIIs–M, nonirrigated; Mountain Shallow Loam range site; Cowers soil—capability unit VIe–M, nonirrigated; Mountain Gravelly Loam range site; Rock outcrop—capability unit VIIIs–X.

Blackett Series

The Blackett series consists of deep, moderately sloping to steep, well-drained soils on outwash and alluvial fans. These soils formed in alluvium derived from acid and intermediate igneous rock. Blackett soils are on the lower fans of the Mineral Mountain Range and south of Greenville. They are associated with Snake Hollow and Blue Star soils. Elevation ranges from 6,100 to 6,600 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper-pinyon, big sagebrush, Indian ricegrass, bluebunch wheatgrass, and annual weeds.

In a representative profile the surface layer is grayish-brown coarse sandy loam about 9 inches thick. The underlying layers are white, very pale brown, or brown, friable light loam or coarse sandy loam. Strong lime accumulations occur at a depth of 8 to 15 inches and are 22 to 47 inches thick.

The available water capacity is about 6 to 7 inches in a 5-foot profile, and the water supplying capacity is 7 to 10 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, and watershed catchment. If necessary for range improvement, clearing and range seeding are suitable practices. The principal limitation is high erodibility.

Representative profile of Blackett coarse sandy loam, 3 to 20 percent slopes, 1⅓ miles north and 4½ miles west of Manderfield; NW¼SW¼ of sec. 12, T. 28 S., R. 8 W.

A11—0 to 2 inches, grayish-brown (10YR 5/2) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft, friable, slightly sticky and slightly plastic; few fine roots; interstitial pores; slightly calcareous; strongly alkaline (pH 8.6); abrupt, smooth boundary.

A12—2 to 9 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many medium and fine and few large roots; few, medium and fine, tubular pores; moderately calcareous; strongly alkaline (pH 8.6); clear, smooth boundary.

C1ca—9 to 40 inches, white (10YR 8/2) coarse sandy loam, pale brown (10YR 6/3) when moist; massive; very friable, nonsticky and nonplastic; few medium and few large roots; few, fine, tubular pores; very strongly calcareous; weakly cemented with lime; strongly alkaline (pH 8.8); gradual, wavy boundary.

C2ca—40 to 56 inches, very pale brown (10YR 7/3) light loam, brown (10YR 5/3) when moist; massive; hard, friable, slightly sticky and nonplastic; few fine roots; few, fine, tubular pores; strongly calcareous; strongly alkaline (pH 8.8); gradual, wavy boundary.

C3—56 to 70 inches, brown (7.5YR 5/4) coarse sandy loam, dark brown (7.5YR 4/4) when moist; massive; hard, friable, slightly sticky and slightly plastic; very few fine roots; common, medium and fine, tubular pores; slightly calcareous; strongly alkaline (pH 8.6).

The A1 horizon is 7 to 11 inches thick. The C horizon is strongly to very strongly calcareous coarse sandy loam to loam. It has color value of 7 or 8 when dry and 6 or 7 when moist and chroma of 1 through 3. Depth to the Cca horizon ranges from 8 to 15 inches. This horizon is 22 to 47 inches thick.

Blackett coarse sandy loam, 3 to 20 percent slopes (BKE).—This soil has the profile described as representative of the series.

Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, wildlife habitat, and watershed catchment, and has a limited use as woodland. Capability unit VIe–U; Upland Limy Loam (Juniper-Pinyon) range site.

Blackett-Blue Star association, 3 to 20 percent slopes (BLE).—This mapping unit is 60 percent Blackett coarse sandy loam, 3 to 20 percent slopes (fig. 2), and 40 percent Blue Star coarse sandy loam, 3 to 10 percent slopes. The Blackett soil is generally on steeper side slopes along natural drainageways, and the Blue Star soil is on the ridges. The Blue Star soil has a profile similar to the one described as representative of the Blue Star series, but the surface layer is free of cobbles. Included with these soils in mapping is a small area of Snake Hollow coarse sandy loam, 3 to 10 percent slopes.

Runoff is medium, and the hazard of erosion is moderate.

These soils are used for range, wildlife habitat, and watershed catchment and have limited use as woodland. Capability unit VIe–U, nonirrigated; Blackett soil—Upland Limy Loam (Juniper-Pinyon) range site; Blue Star soil—Upland Stony Loam (Juniper-Pinyon) range site.

Blackett-Snake Hollow association, 3 to 20 percent slopes, eroded (BNE2).—This mapping unit is about 60 percent Blackett coarse sandy loam, 3 to 20 percent

Figure 2.—**Profile of Blackett coarse sandy loam, 3 to 20 percent slopes, showing the dark-colored surface layer and the thick, light-colored underlying layer that has a strong accumulation of lime.**

slopes, and 40 percent Snake Hollow coarse sandy loam, 3 to 10 percent slopes, eroded. There is no uniformity in pattern of occurrence. Both soils have profiles similar to the ones described as representative of their series, but they have a thinner profile because they are eroded. This association is on lower fans. Included with these soils in mapping are small areas of Sheeprock coarse sandy loam.

Runoff is medium to rapid, and the hazard of erosion is high.

These soils are used for range, wildlife habitat, watershed catchment, and woodland. This association is suitable for clearing and range seeding when such practices are necessary. Capability unit VIe–U, nonirrigated; Blackett soil—Upland Limy Loam (Juniper-Pinyon) range site; Snake Hollow soil—Upland Stony Loam (Juniper-Pinyon) range site.

Black Ridge Series

The Black Ridge series consists of shallow, moderately sloping to steep, well-drained soils. These soils formed in material derived from basic igneous material. Black Ridge soils are on basalt plains northeast of the Cunningham Ranch and southwest of Cove Fort. They are associated with Phage soils and Rock outcrop. Elevation ranges from 6,000 to 6,800 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, big sagebrush, bitterbrush, cliffrose, and cheatgrass.

In a representative profile the surface layer is dark grayish-brown, very cobbly silt loam about 3 inches thick. The subsoil is brown, firm clay, heavy silty clay loam, or clay loam about 12 inches thick. It is underlain by an indurated lime-cemented hardpan that is about 21 inches thick over basalt. Depth to the basalt is about 36 inches.

Black Ridge soils are moderately eroded. The available water capacity is about 2.5 to 3 inches and the water supplying capacity is about 5 to 6 inches above the hardpan. Permeability is slow. Roots can penetrate to a depth of about 15 inches.

These soils are used for range, wildlife habitat, and watershed catchment and have limited use as woodland. They are not suitable for clearing and range seeding because of the cobbly surface and Rock outcrop. They can be improved by good range management.

Representative profile of Black Ridge very cobbly silt loam, 6 to 30 percent slopes, in an area of Black Ridge extremely rocky silt loam, 1½ miles north of Cowboy Spring and ⅛ mile west of road; ¼ mile north and ½ mile west of southeast corner of sec. 36, T. 26 S., R. 8 W.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) very cobbly silt loam, very dark brown (10YR 2/2) when moist; weak and moderate, thick, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common, medium, vesicular pores; neutral (pH 6.7); clear, smooth boundary.

B1t—3 to 7 inches, brown (7.5YR 4/2) heavy silty clay loam, very dark brown (7.5YR 2/2) when moist; weak, medium, prismatic structure that parts to weak, fine, subangular blocky; hard, firm, very sticky and plastic; few medium and fine roots; thin, continuous clay films on ped faces; slightly acid (pH 6.1); clear, smooth boundary.

B2t—7 to 14 inches, brown (7.5YR 5/4) clay, dark brown (7.5YR 4/2) when crushed, and dark brown (7.5YR 4/3) aggregate when moist; strong, medium, prismatic structure that parts to strong, medium, angular blocky; very hard, firm, very sticky and very plastic; common medium and few fine and coarse roots; common medium pores; thick, continuous clay films on ped faces; neutral (pH 6.7); clear, irregular boundary.

B3ca—14 to 15 inches, brown (10YR 5/3) clay loam, dark brown (10YR 4/3) when moist; weak, fine, subangular blocky structure; hard, friable, sticky and plastic; noncalcareous matrix, but many soft lime nodules 0 to ¼ inch in diameter; mildly alkaline (pH 7.4); clear, wavy boundary.

C1ca—15 to 16 inches, very pale brown (10YR 8/3) strongly lime-cemented horizon, very pale brown (10YR 7/3) when moist; massive; very strongly calcareous; mildly alkaline (pH 7.5); abrupt, wavy boundary.

C2cam—16 to 18 inches, indurated lime-cemented hardpan; abrupt, wavy boundary.

C3cam—18 to 36 inches, strongly cemented lime pan, massive; very strongly calcareous; mildly alkaline; abrupt, wavy boundary.

R—36 inches, basalt.

Some areas have a thin mantle of cinders. The A1 horizon is 3 to 5 inches thick. It has color hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. The B2t horizon ranges from heavy clay loam to clay or silty clay. It has color hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. The combined A and B horizons are 14 to 20 inches. Depth to the lime-cemented hardpan ranges from 14 to 20 inches. These soils are underlain by basalt at a depth of about 36 inches.

Black Ridge extremely rocky silt loam, 6 to 30 percent slopes (BRF).—This mapping unit is 60 percent Black Ridge very cobbly silt loam, 6 to 30 percent slopes, and 40 percent Rock outcrop. Rock outcrop occurs throughout the mapping unit. The Black Ridge soil has the profile described as representative of the Black Ridge series.

Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, watershed catchment, and wildlife habitat. Black Ridge soil—capability unit VIIs–U, nonirrigated, Upland Shallow Hardpan (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Blue Star Series

The Blue Star series consists of deep, moderately sloping to strongly sloping, well-drained soils on outwash fans. These soils formed in alluvium derived from acid and intermediate igneous rocks. Blue Star soils are on fans north of The Pass Road along the Mineral Mountains Range. They are associated with Blackett soils. Elevation ranges from 6,000 to 6,500 feet. Mean annual air temperature is 46° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is about 100 to 108 days. The vegetation includes juniper pinyon, big sagebrush, bitterbrush, squirreltail, and three-awn.

In a representative profile the surface layer is grayish-brown and brown coarse sandy loam about 19 inches thick. The upper part of the underlying layer is very pale brown and white, very friable, gravelly coarse sandy loam about 25 inches thick. The lower 16 inches is very pale brown, very strongly calcareous, gravelly loam.

For Blue Star soils the hazard of erosion is moderate. The available water capacity is about 5 to 6 inches and the water supplying capacity is about 8 to 11 inches in a 5-foot profile. Permeability is moderately rapid. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, watershed catchment, and woodland. They are suitable for clearing and range seeding if such practices are necessary.

Representative profile of Blue Star cobbly sandy loam, 3 to 10 percent slopes, 7.5 miles west, 2.0 miles north of Beaver, ¼ mile east from the southwest corner of sec. 32, T. 28 S., R. 8 W.

A11—0 to 1 inch, grayish-brown (10YR 5/2) cobbly sandy loam, brown (10YR 4/3) when moist; single grained; loose, very friable, nonsticky and nonplastic; no roots; mildly alkaline (pH 7.6); clear, smooth boundary.

A12—1 to 4 inches, brown (10YR 5/3) coarse sandy loam, dark brown (10YR 3/3) when moist; single grained; loose, very friable, slightly sticky and nonplastic; common fine roots; few, fine and medium, tubular pores; mildly alkaline (pH 7.6); clear, smooth boundary.

A13—4 to 14 inches, brown (10YR 5/3) coarse sandy loam, dark brown (10YR 3/3) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; common fine, medium, and large roots; common, fine and medium, tubular pores; mildly alkaline (pH 7.6); clear, wavy boundary.

A14—14 to 19 inches, brown (10YR 5/3) coarse sandy loam, dark brown (10YR 3/3) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and medium roots; few, fine and medium, tubular pores; slightly calcareous; moderately alkaline (pH 8.0); gradual, wavy boundary.

C1ca—19 to 37 inches, very pale brown (10YR 7/3) gravelly coarse sandy loam, pale brown (10YR 6/3) when moist; hard, very friable, nonsticky and nonplastic; few fine and common medium roots; common, fine and few, medium, tubular pores; strongly calcareous; soft secondary lime accumulations; strongly alkaline (pH 8.5); gradual, wavy boundary.

C2ca—37 to 44 inches, white (10YR 8/2) gravelly sandy loam, light gray (10YR 7/3) when moist; hard, friable, nonsticky and nonplastic; massive; few fine roots; common, fine, tubular pores; strongly cemented lime nodules; very strongly calcareous; strongly alkaline (pH 8.5); gradual, wavy boundary.

C2ca—44 to 60 inches, very pale brown (10YR 8/3) gravelly loam, very pale brown (10YR 7/3) when moist; massive; hard, friable, nonsticky and slightly plastic; few fine roots; common, fine, tubular pores; strongly cemented lime nodules; very strongly calcareous; strongly alkaline (pH 8.6).

The A1 horizon is 10 to 19 inches thick. It has color value of 4 or 5 when dry and 3 when moist and chroma of 2 or 3. The C horizon below a depth of 40 inches is 10 to 40 percent gravel. The lime horizons are 15 to 30 inches thick and are between 17 and 40 inches from the surface. Between depths of 10 and 40 inches, the texture ranges from coarse sandy loam to gravelly coarse sandy loam or sandy loam and the color value is 5 to 7 when dry and 3 to 7 when moist and chroma is 2 to 3.

Blue Star cobbly sandy loam, 3 to 10 percent slopes (BSD).—This soil has the profile described as representative of the series. It is on alluvial fans surrounding the Mineral Mountains. This soil is used for wildlife habitat and watershed catchment and has limited use as woodland. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIe–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Chipman Series

The Chipman series consists of deep, gently sloping, somewhat poorly drained soils on flood plains and

river terraces. These soils formed in alluvium derived from intermediate igneous and sedimentary material. Chipman soils are in the meadow area between Beaver and Greenville. Elevation ranges from 5,700 to 6,000 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 11 to 13 inches, and the frost-free period is 100 to 108 days. The vegetation is meadow grasses and sedges.

In a representative profile the surface layer is gray silty clay loam about 20 inches thick. The upper 10 to 20 inches of the underlying layer is gray to light-gray, firm, silty clay loam in which lime has accumulated. The lower part is gray to light-gray loam, clay loam, or silty clay loam.

On Chipman soils there is little or no erosion. The available water capacity is 9 to 11 inches in a 5-foot profile. Permeability is slow. Roots can penetrate to a depth of more than 5 feet. The water table generally is between depths of 10 and 30 inches.

These soils are used for meadow hay and pasture. They are suitable for drainage and, if drained, are suited to all locally grown crops.

Representative profile of Chipman silty clay loam, 0.6 mile south and 2½ miles west of Beaver Post Office, 450 feet south of road, sec. 30, T. 29 S., R. 7 W.

A11—0 to 6 inches, gray (10YR 5/1) silty clay loam, very dark brown (10YR 2/2) when moist; weak, medium, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; few, fine, tubular pores; moderately calcareous; mildly alkaline (pH 7.8); clear, wavy boundary.

A12—6 to 20 inches, gray (10YR 5/1) silty clay loam, very dark brown (10YR 2/2) when moist; moderate, medium, granular structure; slightly hard, friable, sticky and plastic; many fine roots; few, fine, tubular pores; strongly calcareous; moderately alkaline (pH 8.2); clear, wavy boundary.

C1ca—20 to 30 inches, gray to light-gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) when moist; few, fine, distinct, dark yellowish-brown (10YR 3/4) mottles; weak, fine, subangular blocky structure; hard, sticky and plastic; few fine roots; few fine pores; strongly calcareous; moderately alkaline; (pH 8.2); clear, wavy boundary.

C2—30 to 60 inches, gray to light-gray (10YR 6/1) loam, dark gray (10YR 4/1) when moist; few, fine, distinct, dark yellowish-brown (10YR 3/4) mottles; massive; hard, firm, sticky and plastic; few fine roots; few fine pores; slightly calcareous; mildly alkaline (pH 7.8); clear, wavy boundary.

The A1 horizon is silty clay loam or clay loam and is 16 to 22 inches thick. It has color value of 4 or 5 when dry and 2 when moist and chroma of 1 or 2. The 10- to 40-inch depth is predominantly silty clay loam or clay loam. A buried A1 horizon is common but does not occur in all places. The lime horizon is 10 to 30 inches below the surface. Some areas have a layer of gravelly loam below a depth of 36 inches. At a depth between 20 and 40 inches the color chroma is 2 or less, and the mottles are distinct or prominent.

Chipman silty clay loam (Ca).—This soil has slopes of 1 to 3 percent. Included in mapping are some small areas of soils that are similar to this Chipman soil but are 20 to 36 inches deep to gravel. These gravelly areas are 1 mile east of Greenville on both the north and the south sides of the road; three-fourths of a mile west and one-half mile north of Beaver Post Office; three-fourths of a mile west of Beaver Post Office on both the north and the south sides of the highway; and 1¼ miles west and between ½ and ¾ mile north of Beaver Post Office. Some small areas ¾ mile east and ¼ mile south of Greenville, near the Beaver River, that are moderately saline are also included.

Runoff is slow, and the hazard of erosion is slight.

This soil is used almost entirely for pasture or meadow hay. If drained, this soil is suitable for cultivation and can be used for locally grown crops. Capability unit Vw–2, irrigated; not in a range site.

Clegg Series

The Clegg series consists of deep, strongly sloping to steep, well-drained soils. These soils are on old alluvial fans, hills, and mountains. They formed in alluvium derived from intermediate igneous material. Clegg soils are in the general area east of the Mineral Mountain Range. They are associated with the Deer Creek soils. Elevation ranges from 6,500 to 7,300 feet. Mean annual air temperature is 40° to 45° F, average annual precipitation is 15 to 18 inches, and the frost-free period is 80 to 100 days. The vegetation is big sagebrush, Gambel oak, bluebunch wheatgrass, lupine, squirreltail, Sandberg bluegrass, locoweed, and phlox.

In a representative profile the surface layer is dark grayish-brown loam or cobbly loam about 10 inches thick. The subsoil is brown or pale-brown, firm, heavy loam or light clay loam about 22 inches thick. The underlying material is white or pale-brown, friable, very strongly calcareous sandy loam or loam. The available water capacity is 9 to 11 inches in a 5-foot profile, and the water supplying capacity is 12 to 13 inches. Permeability is moderately slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, and watershed catchment. They are suitable for clearing and range seeding where such practices are necessary.

Representative profile of Clegg loam, 6 to 30 percent slopes, 5 miles west and 5 miles north of Manderfield, sec. 26, T. 27 S., R. 8 W.

A1—0 to 10 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly plastic; few fine and common medium roots; few, fine, tubular pores; mildly alkaline (pH 7.6); clear, wavy boundary.

B1—10 to 21 inches, brown (10YR 5/3) heavy loam, dark brown (10YR 3/3) when moist; weak, medium, angular blocky structure; hard, friable, slightly sticky and plastic; few fine and medium roots; few, fine, tubular pores; few thin clay films; mildly alkaline (pH 7.8); clear, smooth boundary.

B2t—21 to 28 inches, brown (10YR 5/3) clay loam, dark brown (10YR 3/3) when moist; moderate, medium, angular blocky structure that parts to moderate, fine, angular blocky; hard, firm, slightly sticky and plastic; few fine roots; few, fine, tubular pores; thin to moderately thick, continuous clay films; mildly alkaline (pH 7.8); abrupt, smooth boundary.

B3ca—28 to 32 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) when moist; weak, fine, blocky structure; hard, friable, slightly sticky and slightly plastic; few fine roots; few, fine and medium, tubular pores; few thin clay films; moderately calcareous; moderately alkaline (pH 8.2); gradual, smooth boundary.

C1ca—32 to 54 inches, white (10YR 8/2) sandy loam, light gray (10YR 7/2) when moist; massive; weakly cemented, hard, friable, nonsticky and nonplastic; few fine roots; few, fine, tubular pores; very strongly calcareous; moderately alkaline (pH 8.2); gradual, smooth boundary.

C2ca—54 to 64 inches, very pale brown (10YR 8/3) loam, pale brown (10YR 6/3) when moist; massive; weakly cemented, hard, friable, slightly sticky and slightly plastic; very fine and medium tubular pores; very strongly calcareous; moderately alkaline (pH 8.4).

The A1 horizon is 4 to 11 inches thick. It has color value of 3 or 4 when dry and 2 or 3 when moist and chroma of 2 or 3. The B2t horizon is loam, clay loam, or sandy clay. It has color hue of 10 YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 to a depth of 20 inches. In places, at a depth below 20 inches, the color value is 6 when dry and 4 when moist and chroma is 4. Depth to the horizon of lime accumulation ranges from 24 to 45 inches. This horizon is 24 inches or more thick and is loam or sandy loam. In places some gravel and cobbles occur in the profile.

Clegg loam, 6 to 30 percent slopes (CEF).—This soil is on alluvial fans, rolling hills, and mountains. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIe–U, nonirrigated; Upland Loam range site.

Clegg cobbly loam, 6 to 30 percent slopes (CGF).—This soil has a profile similar to the one described as representative of the series, but the surface layer is 20 to 50 percent cobbles and the underlying material is gravelly. The surface layer is 4 to 8 inches thick.

Included in mapping this soil in the North Creek area are small areas of Deer Creek very cobbly loam, 30 to 50 percent slopes, eroded. Also included are a few rock outcrops.

Runoff is medium, and the hazard of erosion is moderate.

Some limitations to range seeding are imposed by the cobbly surface. Capability unit VIe–U, nonirrigated; Upland Loam range site.

Clegg very rocky loam, 6 to 30 percent slopes (CLF).—This mapping unit is about 80 percent Clegg cobbly loam, 6 to 30 percent slopes, and 20 percent Rock outcrop.

The Clegg soil has a profile similar to the one described as representative of the series, but the surface layer is cobbly and some scattered cobbles are in the profile. Runoff is medium, and the hazard of erosion is moderate. Included in mapping are very small areas of Flowell loam, 3 to 6 percent slopes, eroded, and Murdock silt loam, 1 to 3 percent slopes.

This unit is somewhat limited for grazing, brush control, and seeding because part of the unit is Rock outcrop and the surface soil is cobbly. These practices can be implemented if the rock outcrops are avoided. Clegg soil—capability unit VIe–U, nonirrigated; Upland Loam range site; Rock outcrop—capability unit VIIIs–X.

Cokel Series

The Cokel series consists of deep, moderately sloping to moderately steep, well-drained coarse sandy loam underlain by gravelly coarse sand. These soils formed in alluvium and colluvium derived from acid and intermediate igneous material. These soils are on hills and ridgetops. Cokel soils are west of Manderfield and south of Greenville. They are associated with Sheeprock soils. Elevation ranges from 6,200 to 6,800 feet. Mean annual air temperature is 46° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, pinyon, big sagebrush, bitterbrush, and Mormon-tea.

In a representative profile the surface layer is grayish-brown cobbly coarse sandy loam about 9 inches thick. The upper 13 inches of the underlying layer is very pale brown, very friable sandy loam. The lower part is pale-brown, loose gravelly coarse sand.

On Cokel soils the hazard of erosion is moderate to high. The available water capacity is 3 to 3.5 inches in a 5-foot profile, and the water supplying capacity is 5 to 8 inches. Permeability is moderately rapid. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, watershed catchment, and wildlife habitat. They are suitable for clearing and range seeding, if such practices are necessary. Care should be used in these operations because the soil is highly erodible.

Representative profile of Cokel cobbly coarse sandy loam, 3 to 20 percent slopes, in an area of Sheeprock-Cokel complex, 3 to 30 percent slopes, 2 miles north and 2¾ miles west of Manderfield, ½ mile south and ¼ mile east of the northwest corner of sec. 7, T. 28 S., R. 8 W.

A11—0 to 2 inches, grayish-brown (10YR 5/2) cobbly coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; single grained; loose, very friable; few coarse, medium, and fine roots; interstitial pores; 30 percent cobbles and gravel; moderately calcareous; moderately alkaline (pH 8.0); abrupt, smooth boundary.

A12—2 to 9 inches, grayish-brown (10YR 5/2) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure that parts to weak, fine, subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; few fine and medium and common coarse roots; few, fine and medium, tubular pores; moderately calcareous; moderately alkaline (pH 8.2); clear, smooth boundary.

C1ca—9 to 22 inches, very pale brown (10YR 7/3) sandy loam, brown (10YR 5/3) when moist; massive; hard, very friable, slightly sticky and slightly plastic; common fine and few medium roots; few fine and medium pores; strongly calcareous; moderately alkaline (pH 8.2); gradual, wavy boundary.

IIC2—22 to 45 inches, pale-brown (10YR 6/3) gravelly coarse sand, brown (10YR 4/3) when moist; single grained; loose when dry and moist; few fine and medium roots; interstitial pores; 40 percent cobbles and gravel; noncalcareous, but has moderately calcareous pockets; mildly alkaline (pH 8.2); gradual, smooth boundary.

IIC3—45 to 72 inches, gravelly coarse sand, but less gravelly than IIC2 horizon.

The A1 horizon is 3 to 10 inches thick. It has color value of 5 when dry and 3 when moist and chroma of 2 or 3. The C horizon is sandy loam in the upper 10 to 20 inches but gravelly coarse sand or gravelly loamy sand below that depth. Color value in and below the horizon of lime accumulation is 6 through 8 when dry and 4 through 6 when moist, and chroma is 1 through 3.

Cokel coarse sandy loam, 3 to 15 percent slopes (CME).—This soil has a profile similar to the one described as representative of the series, but the surface layer is less than 10 percent cobbles and is 30 inches thick over the gravelly substratum. Runoff is medium, and the hazard of erosion is moderate to high. Capability unit VIs–U, nonirrigated; Upland Limy Loam (Juniper-Pinyon) range site.

Colluvial Land

Colluvial land and Shale outcrop (CN) consists of Colluvial land and Shale outcrop in no definite pattern of occurrence. The Colluvial land occurs mainly along the tops of ridges and extends over the breaks. Shale outcrop occurs mainly on the side slopes. These land types are about one-half mile west of Manderfield.

The Colluvial land has a wide range of cobbly and gravelly soil textures. The Shale outcrop consists only of exposed shale.

Sparse native vegetation of juniper, pinyon, Indian ricegrass, squirreltail, forbs, and big sagebrush grow in areas of this mapping unit. This land has little or no value for farming. Capability unit VIIIs–X.

Cowers Series

The Cowers series consists of deep, gently sloping to steep, well-drained soils that formed in alluvium and colluvium derived from granitic material. These soils are on mountains. Cowers soils are at higher elevations in the Mineral Mountain Range. They are associated with Bearskin soils. Elevation ranges from 6,800 to 7,800 feet. Mean annual air temperature is 39° to 43° F, average annual precipitation is 16 to 20 inches, and the frost-free period is 65 to 100 days. The vegetation is Gambel oak, serviceberry, big sagebrush, and bluebunch wheatgrass.

In a representative profile the surface layer is dark grayish-brown coarse sandy loam about 10 inches thick. The subsoil is dark grayish-brown friable or firm loam 11 inches thick and light grayish brown gravelly sandy loam 12 inches thick. The underlying material is pale-brown, friable, gravelly sandy loam.

Cowers soils are slightly to moderately eroded. The available water capacity is 7 to 7.5 inches in a 5-foot profile, and the water supplying capacity is 9 to 13 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, and watershed catchment. They are suitable for clearing and range seeding if such practices are necessary. Care should be used in applying these practices because of the high erodibility of these soils.

Representative profile of Cowers coarse sandy loam, 2 to 30 percent slopes, in an area of the Bearskin-Cowers very rocky association, eroded, 8 miles north, 7.25 miles west of Manderfield, NE¼NE¼ sec. 8, T. 27 S., R. 8 W.

A1—0 to 10 inches, dark grayish-brown (10YR 4/2) coarse sandy loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; common, fine and medium, tubular pores; neutral (pH 6.8); gradual, smooth boundary.

B2—10 to 21 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, coarse, subangular blocky structure that parts to fine, subangular blocky; very hard, firm, slightly sticky and slightly plastic; few fine and medium roots; common fine and medium tubular pores and a few large ones; thin clay coatings on sand grains and thin clay bridgings between particles; neutral (pH 6.8); clear, wavy boundary.

B3—21 to 33 inches, light grayish-brown (10YR 6/2) gravelly sandy loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; very hard, friable, slightly plastic; few fine and medium roots; few, fine, tubular pores; thin clay coatings on sand grains; neutral (pH 6.9); gradual, wavy boundary.

C—33 to 70 inches, pale-brown (10YR 6/3)gravelly sandy loam, dark brown to brown (10YR 4/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; very few fine and medium roots; few, fine, tubular pores; moderately calcareous; mildly alkaline (pH 7.4).

The A1 horizon is 4 to 12 inches thick. It has color hue of 10YR or 7.5YR and value of 4 when dry and 2 or 3 when moist. The B2 horizon is loam, sandy clay loam, or gravelly sandy loam. It has color hue of 10YR or 7.5YR and value of 4 or 5 when dry and 3 or 4 when moist. Dark color value of 3.5 when moist extends to a depth of 10 to 15 inches. The combined A and B horizons are 20 to 36 inches thick. The C horizon is gravelly sandy loam and coarse sand.

Cowers coarse sandy loam, 2 to 30 percent slopes, eroded (COF2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 4 inches thick and the soil is more stratified. The slopes range from 2 to 30 percent, but the dominant slopes are 2 to 10. This soil is moderately eroded. Runoff is medium to rapid, and the hazard of erosion is high. Capability unit VIe–M, nonirrigated; Mountain Gravelly Loam range site.

Cowers association, 2 to 30 percent slopes, eroded (CRF2).—This mapping unit is about 60 percent Mineral Mountain coarse sandy loam, noncalcareous variant, 2 to 30 percent slopes, eroded, and 40 percent Cowers coarse sandy loam, 2 to 30 percent slopes, eroded.

The Mineral Mountain noncalcareous variant has the profile described as representative of the variant. The Cowers soil has a profile similar to the one described as representative of the series, but the surface soil is 2 to 3 inches thinner.

These soils are used for range, wildlife habitat, and watershed catchment. They are suitable for clearing and range seeding where such practices are needed. Runoff is moderate to rapid, and the hazard of erosion is high. Capability unit VIe–M, nonirrigated; Mineral Mountain, noncalcareous variant—Mountain Loam range site; Cowers soil—Mountain Gravelly Loam range site.

Cowers-Bearskin association, 2 to 30 percent slopes, eroded (CSF2).—This mapping unit is 50 percent Cowers coarse sandy loam, 2 to 30 percent slopes, eroded, and 40 percent Bearskin coarse sandy loam, 2 to 30 percent slopes, eroded. The Cowers soil is on mountains and the Bearskin soil is mainly on the ridgetops but in places is on side slopes. This association is

extensive in the Mineral Mountain Range near Cherry Creek Pass Road.

The Cowers soil has a profile similar to the one described as representative of the series, but the surface layer is 2 to 3 inches thinner. The Bearskin soil has the profile described as representative of the Bearskin series.

These soils are used for range, wildlife habitat, and watershed catchment. Cowers soils are suitable for clearing and range seeding if such practices are needed. Bearskin soils are not suitable for clearing and seeding because they are shallow. Runoff is medium to rapid, and the hazard of erosion is high. Cowers soil—capability unit VIe–M, nonirrigated; Mountain Gravelly Loam range site; Bearskin soil—capability unit VIIs–M, nonirrigated; Mountain Shallow Loam range site.

Decca Series

The Decca series consists of deep, somewhat excessively drained soils underlain by sand and gravel. These soils formed in alluvium derived from mixed igneous and quartzite material. They are on dissected fans, terraces, and hills. Decca soils are mainly in the area south and west of Beaver and extend to the lower fans of the Mineral Mountain Range. They are also near Antelope Spring and Twin Peak in the northern end of the survey area. They are associated with Hiko Peak soils. Elevation ranges from 5,400 to 5,900 feet, mean annual air temperature is 47° to 49° F, average annual precipitation is 9 to 12 inches, and the frost-free period is 100 to 108 days. The vegetation is big sagebrush, Indian ricegrass, squirreltail, galleta, and annual weeds.

In a representative profile the surface layer is brown loam about 4 inches thick. The subsoil is brown, friable, sandy clay loam and pale-brown, calcareous gravelly loam about 11 inches thick. The upper 5 inches of the underlying material is very pale brown, very gravelly sandy loam that is very strongly calcareous and weakly cemented in places. The lower part is sand and gravel.

Decca soils are slightly to moderately eroded. The available water capacity is 3 to 4 inches in a 5-foot profile, and the water supplying capacity is about 5 to 8 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, watershed catchment, and irrigated crops. The irrigated crops are alfalfa, small grain, pasture plants, and occasionally silage corn. These soils are not well suited to range seeding because of low precipitation. Range vegetation can be improved through good management.

Representative profile of Decca loam, 1 to 3 percent slopes, 0.3 mile south of Beaver River bridge on old State Highway 21 at Adamsville and 150 feet west of the highway, sec. 31, T. 29 S., R. 8 W.

A1—0 to 4 inches, brown (10YR 5/3) loam, dark brown (10YR 4/3) when moist; weak, thick, platy structure that parts to moderate, thin platy; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few, fine, tubular pores; mildly alkaline (pH7.5); abrupt, smooth boundary.

B2t—4 to 10 inches, brown (10YR 5/3) sandy clay loam marginal to loam, brown to dark brown (7.5YR 4/3) when moist; weak, coarse, subangular blocky structure that parts to fine blocky; hard, friable, sticky and plastic; common fine and few medium roots; few, fine, tubular pores; few thin clay films occurring as bridgings between sand grains; neutral (pH 7.3); clear, wavy boundary.

B3ca—10 to 15 inches, pale-brown (10YR 6/3) gravelly loam, brown (10YR 4/3) when moist; weak, subangular blocky structure; slightly sticky and plastic; common fine roots; few, fine, tubular pores; moderately calcareous; mildly alkaline (pH 7.6); clear, wavy boundary.

C1ca—15 to 20 inches, very pale brown (10YR 8/3) very gravelly sandy loam, pale brown (10YR 6/3) when moist; weak, subangular blocky structure; very hard, weakly cemented, firm, slightly sticky and slightly plastic; common fine roots; few, fine, tubular pores; strongly calcareous; mildly alkaline (pH 7.4); clear, wavy boundary.

IIC2—20 to 60 inches, varicolored sand and gravel, mainly grayish-brown (10YR 5/2) very gravelly sand, dark grayish brown (10YR 4/2) when moist; single grained; loose when dry or moist; few fine roots; slightly calcareous; mildly alkaline (pH 7.5).

The A1 horizon is 4 to 6 inches thick. It has color value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 or 3. In places the A1 and B2t horizons are calcareous. The B2t horizon is sandy clay loam, loam, or light clay loam. It has color hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 when moist, and chroma of 3 or 4. Depth to the Cca horizon is 12 to 20 inches. This horizon is 5 to 30 inches thick. The C horizon ranges from very gravelly sandy loam to very gravelly sand and sand.

Decca gravelly sandy loam, 3 to 6 percent slopes (DaC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is gravelly sandy loam that is 20 to 50 percent gravel. The water intake rate is slightly higher than that in Decca loam, 1 to 3 percent slopes, and the available water holding capacity is slightly less. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for irrigated crops, pasture, watershed catchment, wildlife habitat, and range. Capability unit VIIs–S, nonirrigated, and IVs–24, irrigated; Semidesert Stony Loam range site.

Decca cobbly sandy loam, 10 to 30 percent slopes (DCF).—This soil has a profile similar to the one described as representative of the series, but the surface layer is cobbly sandy loam that is 20 to 40 percent cobbles. The water intake rate is slightly higher than that in Decca loam, 1 to 3 percent slopes, and available water capacity is slightly less. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

This soil is used for range, wildlife habitat, and watershed catchment. It is too steep for irrigation other than by sprinklers. Capability unit VIIs-S, nonirrigated; Semidesert Stony Loam range site.

Decca loam, 1 to 3 percent slopes (DeB).—This soil has the profile described as representative of the series. It is on alluvial fans. Runoff is slow, and the hazard of erosion is slight.

This soil is used for irrigated crops, watershed catchment, wildlife habitat, and range. Capability unit VIIs–S, nonirrigated, and IVs–24, irrigated; Semidesert Stony Loam range site.

Decca loam, 3 to 6 percent slopes (DeC).—On this soil, runoff is medium, and the hazard of erosion is moderate. This soil is used mainly for irrigated crops. A small part is used as range. Capability unit VIIs–S, nonirrigated, and IVs–24, irrigated; Semidesert Stony Loam range site.

Decca very rocky loam, 2 to 10 percent slopes (DFD).—This mapping unit is 80 percent Decca cobbly loam, 2 to 10 percent slopes, and 20 percent Rock outcrop.

The Decca soil has a profile similar to the one described as representative of the series, but the surface layer is cobbly and is 20 to 50 percent cobbles. Runoff is medium, and the hazard of erosion is slight to moderate.

This soil is used for range, watershed catchment, and wildlife habitat. Decca soil—capability unit VIIs–S, nonirrigated, Semidesert Stony Loam range site; Rock outcrop—capability unit VIIIs–X.

Decca-Hiko Peak complex, 1 to 30 percent slopes (DHF).—This mapping unit is 60 percent Decca loam, 3 to 15 percent slopes, and 40 percent Hiko Peak coarse sandy loam, 3 to 30 percent slopes. These soils occur in such an intricate pattern they cannot be mapped separately at the scale used. The Decca soil is on the lower side slopes and in the more gently sloping areas between the ridges. The Hiko Peak soil is on the ridgetops and the steeper side slopes.

The Hiko Peak soil has a profile similar to the one described as representative of the Hiko Peak series, but the surface layer is not cobbly and the texture is coarse sandy loam. The slope is 3 to 30 percent. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Included in mapping are small areas of Hiko Peak soils that have a cobbly surface layer.

These soils are used for range, watershed catchment, and wildlife habitat. Capability unit VIIs–S, nonirrigated; Semidesert Stony Loam range site.

Deer Creek Series

The Deer Creek series consists of deep, moderately sloping to very steep, well-drained soils that formed in alluvium and colluvium derived from intermediate igneous material. These soils are on mountains and hills. Deer Creek soils are in mountainous areas, mainly in the eastern and southern parts of the survey area. They are associated with Red Butte, Pass Canyon, and Clegg soils. Elevation ranges from 6,400 to 7,200 feet. Mean annual air temperature is 40 to 44° F, average annual precipitation is 14 to 17 inches, and the frost-free period is 80 to 100 days. The vegetation is big sagebrush, Gambel oak, bitterbrush, lupine and bluebunch wheatgrass. In the southern end of the survey area, where this soil is associated with Red Butte soils, pinyon pine and juniper are the dominant vegetation.

In a representative profile (fig. 3) the surface layer is dark grayish-brown, cobbly or very cobbly loam about 6 inches thick. The subsoil is brown, firm, cobbly heavy clay loam about 18 inches thick. The underlying material is very strongly calcareous, very pale brown, cobbly sandy loam that decreases in lime content as it increases in depth.

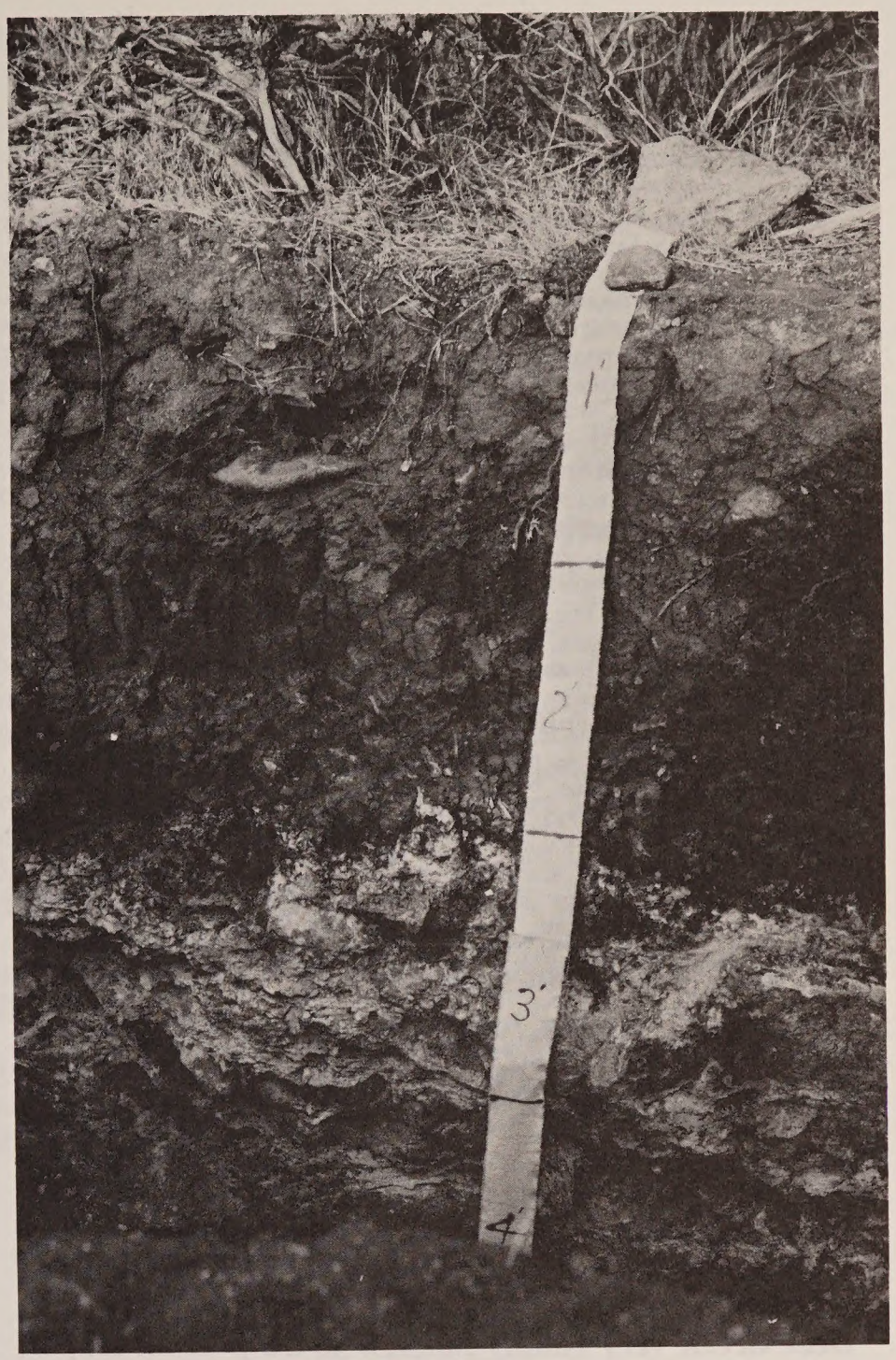

Figure 3.—**Profile of Deer Creek cobbly loam, 3 to 30 percent slopes, eroded.**

Deer Creek soils are moderately eroded. The available water capacity is about 8 to 9.5 inches in the 5-foot profile, and the water supplying capacity is about 12 to 13 inches. Permeability is slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, and watershed catchment. They are suitable for clearing and range seeding where surface cobbles and slope permit and where such practices are necessary.

Representative profile of Deer Creek cobbly loam, 3 to 30 percent slopes, eroded, 8½ miles north and 1½ miles east of Manderfield; 0.2 mile north of the southeast corner of sec. 11, T. 27 S., R. 7 W.

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) cobbly loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and plastic; common fine and medium roots; few, fine, tubular pores; mildly alkaline (pH 7:6); clear, smooth boundary.

B21t—6 to 11 inches, dark-brown (7.5YR 4/2) cobbly heavy clay loam, dark brown (7.5YR 3/2) when moist; moderate, fine, subangular blocky structure; very hard, firm, sticky and plastic; common fine and medium roots; few, fine, tubular pores; thin, continuous clay films, mildly alkaline (pH 7.8); clear, smooth boundary.

B22t—11 to 24 inches, brown (7.5YR 5/3) cobbly heavy clay loam, brown to dark brown (7.5YR 4/2) when moist; moderate, coarse, angular blocky structure that parts to moderate, fine, blocky; very hard, firm, sticky and plastic; few, fine, medium, and large roots; few, fine tubular pores; moderate, continuous clay films; mildly alkaline (pH 7.8); abrupt, wavy boundary.

C1ca—24 to 46 inches, very pale brown (10YR 8/3) cobbly sandy loam, very pale brown (10YR 7/3) when moist; massive; hard, very friable, nonsticky and slightly plastic; few fine roots; very strongly calcareous; moderately alkaline (pH 8.0); gradual, wavy boundary.

C2ca—46 to 65 inches, white (10YR 8/2) cobbly coarse sandy loam, light brownish gray (10YR 6/2) when moist; massive; loose, very friable, nonsticky and nonplastic; moderately calcareous; moderately alkaline (pH 8.2).

The A1 horizon is 2 to 11 inches thick. It has color value of 4 when dry and 2 when moist and chroma of 2 or 3. The B2t horizon ranges from cobbly heavy clay loam to cobbly light clay. It has color value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 to 4. The combined A and B horizons are 20 to 42 inches thick. Cobbles range from 20 to 50 percent, by volume, in the B2t horizon. Horizon of lime accumulation is 12 to 40 inches thick and 20 to 42 inches below the surface.

Deer Creek cobbly loam, 3 to 30 percent slopes, eroded (DKF2).—This soil is on gently rolling to steep sides of hills and mountains. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate. The soil is moderately eroded. Available water capacity is high.

Some limitations to range seeding are imposed by the cobbly surface. Capability unit VIe–U, nonirrigated; Upland Loam range site.

Deer Creek very cobbly loam, 3 to 20 percent slopes, eroded (DLE2).—This soil is along the Beaver-Iron County line east of old U.S. Highway 91. Cobbles cover 50 to 70 percent of the surface. The available water capacity is high. Runoff is medium, and the hazard of erosion is moderate.

This soil is not suited to range seeding with drills because the surface is very cobbly. Brush management may be beneficial in areas of excess brush and in areas where there is an adequate understory of grass. Capability unit VIIs–U, nonirrigated; Upland Loam range site.

Draper Series

The Draper series consists of deep, gently sloping, somewhat poorly drained soils that formed in alluvium derived from intermediate igneous and quartzite material. These soils are on flood plains and river terraces. Draper soils are in the bottom of Beaver Valley, near Beaver. Elevation ranges from 5,700 to 6,000 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 11 to 13 inches, and the frost-free period is 100 to 108 days. These soils are generally moist. The vegetation is meadow grasses and clovers.

In a representative profile the surface layer is dark grayish-brown loam about 16 inches thick. The upper 32 inches of the underlying layer is grayish-brown, friable loam and very fine sandy loam that has distinct mottles. The lower part is gravelly sand that generally occurs below a depth of about 48 inches.

On Draper soils there is little or no erosion. The available water capacity is 8 to 9 inches in a 5-foot profile. Permeability is moderate. Roots can penetrate to a depth of about 60 inches. The water table generally occurs between depths of 30 and 40 inches. These soils are used principally for meadow hay, pasture plants, and irrigated crops. They can be drained.

Representative profile of Draper loam, 1 to 3 percent slopes, ½ mile east and ½ mile south of the Beaver Post Office on west side of road, sec. 22, T. 29 S., R. 7 W.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and few medium roots; few, fine, tubular pores; mildly alkaline (pH 7.8); abrupt, smooth boundary.

A12—7 to 16 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, prismatic structure that parts to weak, subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine and few medium roots; few, fine and medium, tubular pores; mildly alkaline (pH 7.6); gradual, wavy boundary.

C1—16 to 32 inches, grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; few, fine, faint, dark-brown (10YR 3/3) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few, fine and medium, tubular pores; mildly alkaline (pH 7.3); gradual, wavy boundary.

C2—32 to 48 inches, grayish-brown (10YR 5/2) very fine sandy loam, very dark grayish brown (10YR 3/2) when moist; many, medium, distinct, dark-brown (7.5YR 4/4) mottles; massive; very friable, nonsticky and nonplastic; few fine and medium roots; no pores; mildly alkaline (pH 7.2); gradual, wavy boundary.

C3—48 to 60 inches, loose, gravelly sand.

The A1 horizon is 10 to 16 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 2 or 3. In places the C horizon contains gravel and sand between depths of 36 and 48 inches. In some part of the C horizon, between depths of 20 and 40 inches, are prominent or distinct mottles. The chroma is 2 or less.

Draper loam, 1 to 3 percent slopes (DrB).—On this soil, runoff is slow and the hazard of erosion is slight. This soil has some limitation because of its high water table. If drained, it is suitable for all locally grown crops. Capability unit IIw–2, irrigated.

Draper Variant

The Draper variant consists of deep, gently sloping, somewhat poorly drained soils on river terraces and flood plains. These soils formed in alluvium derived from mixed igneous and quartzite material. They are on the valley bottom between Beaver and Greenville.

Elevation ranges from 5,700 to 6,000 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 11 to 13 inches, and the frost-free period is 100 to 108 days. These soils are generally moist. The vegetation includes meadow grasses, clovers, and sedges.

In a representative profile the surface layer is dark-brown loam about 9 inches thick. Below this is 6 inches of brown gravelly loam. Next is pale-brown gravelly sandy loam that is mottled and about 10 inches thick. At a depth of about 25 inches is gravel and very gravelly sand.

The water table fluctuates during the year. It is highest in spring and recedes in summer and fall as the supply of irrigation water decreases.

On the Draper variant, there is little or no erosion. The available water capacity is 4.5 to 5.5 inches in a 5-foot profile. Permeability is moderate. The water table is generally between depths of 15 and 30 inches. Roots can penetrate to a depth of 60 inches.

Meadow pasture and meadow hay are grown on these soils, and in some partly drained areas, irrigated crops of alfalfa and small grain are grown. These soils can be drained, and if the water table is lowered to a depth of 24 to 30 inches, all the locally suited crops can be grown.

Representative profile of Draper loam, sandy subsoil variant, 0.6 mile west of Beaver Post Office and 100 feet north of the highway; NW¼ sec 21, T. 29 S., R. 7 W.

O1—2 inches to 0, meadow sod containing some mineral soil material.

A1—0 to 9 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; few, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure that parts to moderate, fine, subangular blocky; slightly hard or hard, friable, slightly sticky and slightly plastic; many fine roots; few fine pores; neutral (pH 7.0); clear, wavy boundary.

AC—9 to 15 inches, brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) when moist; common, fine, faint, dark yellowish-brown (10YR 4/4) mottles; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; few fine pores; neutral (pH 6.8); clear, wavy boundary.

C1—15 to 25 inches, pale-brown (10YR 6/3) gravelly sandy loam, brown to dark brown (10YR 4/3) when moist; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine roots; few fine pores; moderately alkaline (pH 7.9).

IIC2—25 to 60 inches, gravel and very gravelly sand.

The A1 horizon is loam or heavy loam that ranges from 8 to 12 inches in thickness. The upper part of the profile, at depths between 10 and 40 inches, is gravelly loam or gravelly sandy loam, and the lower part ranges from very gravelly sandy loam to very gravelly sand or gravel.

Draper loam, sandy subsoil variant (Ds).—On this soil, runoff is slow, and the hazard of erosion is slight.

This soil has limitations because of the gravelly soil material and the high water table. If drained and the water table controlled, the soil is suited to locally grown crops. Capability unit Vw–2, irrigated.

Escalante Series

The Escalante series consists of deep, gently sloping to strongly sloping, well-drained soils on alluvial fans and outwash plains. These soils formed in alluvium derived from intermediate igneous and sedimentary materials. Escalante soils are near Antelope Spring, northeast of Milford, and near Greenville, as well as in valleys near Antelope Point. They are associated with Hiko Peak soils. Elevation ranges from 5,500 to 6,000 feet. Mean annual air temperature is 47° to 49° F, average annual precipitation is 9 to 12 inches, and the frost-free period is 105 to 115 days. The vegetation is big sagebrush, yellowbrush, galleta, and squirreltail.

In a representative profile the surface layer is pale-brown sandy loam about 6 inches thick. The upper 19 inches of the underlying material is pale-brown and very pale brown, very friable light sandy loam that has strong lime accumulations at a depth of 10 to 15 inches. The lower 35 inches is very pale brown and pale-brown loamy sand and fine sand.

Escalante soils are moderately eroded. The available water capacity is 5.5 to 6.5 inches in a 5-foot profile, and the water supplying capacity is 4 to 5 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used mainly for range. They are not suitable for clearing and range seeding because rainfall is low.

Representative profile of Escalante sandy loam, 2 to 10 percent slopes, eroded, 9 miles west of Cove Fort on the south side of the Black Rock Road, sec. 17, T. 25 S., R. 8 W.

A11—0 to 3 inches, pale-brown (10YR 6/3) sandy loam, dark grayish brown (10YR 4/2) when moist; weak, thin, platy structure that parts to weak, fine, granular; soft, very friable, nonsticky and nonplastic; few fine roots; few, fine, tubular pores; strongly calcareous; strongly alkaline (pH 8.8); abrupt, smooth boundary.

A12—3 to 6 inches, pale-brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) when moist; weak, fine, granular structure; soft, very friable, nonsticky and nonplastic; few, fine and medium, tubular pores; strongly calcareous; strongly alkaline (pH 8.8); clear, smooth boundary.

C1—6 to 13 inches, pale-brown (10YR 6/3) sandy loam, brown to dark brown (10YR 4/3) when moist; massive; soft, very friable, nonsticky and nonplastic; few, fine, medium, and large, tubular pores; strongly calcareous; strongly alkaline (pH 8.8); clear, wavy boundary.

C2ca—13 to 25 inches, very pale brown (10YR 7/3) light sandy loam, pale brown (10YR 5.6/3) when moist; massive; very hard, very friable, nonsticky and nonplastic; few, fine, medium, and large roots; few, fine and medium, tubular pores; very strongly calcareous; strongly alkaline (pH 8.8); gradual, wavy boundary.

C3ca—25 to 44 inches, very pale brown (10YR 7/3) loamy sand, yellowish brown (10YR 5/4) when moist; massive; very hard, very friable, nonsticky and nonplastic; very few fine roots; few fine tubular pores; very strongly calcareous; strongly alkaline (pH 9.0); clear, wavy boundary.

C4—44 to 60 inches, pale-brown (10YR 6/3) fine sand, brown (10YR 5/3) when moist; single grained; loose, nonsticky and nonplastic; very few fine roots; interstitial pores; strongly calcareous; strongly alkaline (pH 9.0).

The A1 horizon is 3 to 7 inches thick. It has color value of 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The C horizon, at a depth of 10 to 40 inches, is predominantly sandy loam, but in places it is sandy loam or sand below a depth of 25 inches. It has color value of 6 to 8 when dry and 5 or 6 when moist and chroma of 2 or 4. Layers of lime accumulation 20 to 40 inches thick begin at a depth of 10 to 15 inches.

Escalante sandy loam, 2 to 10 percent slopes, eroded (ECD2).—This soil is in the vicinity of Antelope Point and Greenville. It is moderately eroded and has a few small gullies and a few small hummocks around plants. This soil has the profile described as representative of the series. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used mainly for range. Capability unit VIIe–S, nonirrigated; Semidesert Limy Loam range site.

Escalante-Hiko Peak complex, 2 to 10 percent slopes, eroded (ESD2).—This mapping unit is 55 percent Escalante sandy loam, 2 to 10 percent slopes, eroded, 40 percent Hiko Peak cobbly coarse sandy loam, 3 to 10 percent slopes, eroded, and 5 percent Haybourne coarse sandy loam.The Escalante soil occurs between ridges and the Hiko Peak soil on ridgetops.

The Hiko Peak soil has a profile similar to the one described as representative of that series, but its surface layer is cobbly coarse sandy loam and is more eroded. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This mapping unit is used for range, wildlife habitat, and watershed catchment. Range seeding is unsuccessful because rainfall is low. Capability unit VIIe–S, nonirrigated; Escalante soil—Semidesert Limy Loam range site, Hiko Peak soil—Semidesert Stony Loam range site.

Etta Series

The Etta series consists of deep, gently sloping, well-drained soils on flood plains and outwash fans. These soils formed in alluvium derived from mixed igneous material. Etta soils are in Pine Creek and in Wildcat Valley near Cove Fort and north of Manderfield. They are associated with Ushar soils. Elevation ranges from 5,800 to 6,100 feet. The mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is big sagebrush, bluebunch wheatgrass, Indian ricegrass, cheatgrass, and annual weeds.

In a representative profile the surface layer is dark grayish-brown loam and clay loam about 13 inches thick. The underlying layers are grayish-brown, firm clay loam.

On Etta soils, the hazard of erosion is slight. The available water capacity is 9 to 11 inches in a 5-foot profile, and the water supplying capacity is 9 to 11 inches. Permeability is moderately slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, and irrigated and dryfarmed crops. Irrigated crops are alfalfa and small grain. Alfalfa responds to phosphate fertilizer, and small grain to nitrogen fertilizer. The cropping system used in dryfarmed areas is a wheat-fallow rotation. These soils are suitable for clearing and range seeding, if such practices are necessary.

Representative profile of Etta loam, 3.4 miles south of Beaver-Millard County line on U.S. Highway 91, 440 feet west of the road; sec. 28, T. 26 S., R. 7 W.

Ap—0 to 3 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; slightly hard, firm, slightly sticky and plastic; common medium roots; common medium pores; neutral (pH 7.3); clear, smooth boundary.

A12—3 to 13 inches, dark grayish-brown (10YR 4/2) clay loam, very dark brown (10YR 2/2) when moist; weak, coarse, angular blocky structure; hard, firm, sticky and plastic; few medium roots; few fine pores; neutral (pH 7.2); clear, smooth boundary.

C1—13 to 40 inches, grayish-brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) when moist; massive; hard, firm, sticky and plastic; few fine roots; few fine pores; neutral (pH 7.0); diffuse, wavy boundary.

C2—40 to 64 inches, grayish-brown clay loam that has few lime flecks; very dark grayish brown when moist; massive; hard, firm, sticky and plastic; few fine roots; few fine pores; neutral (pH 7.0).

The A1 horizon is 10 to 18 inches thick. It has color hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2. The C horizon is dominantly clay loam, but in places it has strata of coarser-textured material. In places flecks of lime and veins of weak lime accumulation occur in the C horizon.

Etta loam (Et).—This soil occurs on gently sloping flood plains and outwash fans in valleys. It has the profile described as representative of the series. Slopes are 1 to 3 percent. Runoff is slow, and the hazard of erosion is slight.

This soil is used for irrigated and dryfarmed crops, watershed catchment, range, and wildlife habitat. Capability unit IVe–UZ, nonirrigated, and IIe–2, irrigated; Upland Loam range site.

Etta Variant

The Etta variant consists of gently sloping, well-drained soils on flood plains and valley bottoms. These soils formed in alluvium derived from mixed igneous material. They are in the Pine Creek and Cove Fort areas. Elevation ranges from 5,900 to 6,100 feet. Mean annual air temperature is 46° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is big sagebrush, bluebunch wheatgrass, Indian ricegrass, rabbitbrush, and annual weeds.

In a representative profile the surface layer is dark-gray clay about 5 inches thick. The subsoil is grayish-brown, very firm light clay about 33 inches thick. The underlying layer is pinkish-gray firm clay loam in the upper part and light reddish-brown, friable, sandy clay loam below a depth of 48 inches.

On soils of the Etta variant the hazard of erosion is slight. The available water capacity is 10 to 11 inches in a 5-foot profile, and the water supplying capacity is 9 to 11 inches. Permeability is slow. Roots can penetrate to a depth of 60 inches or more.

These soils are used for irrigated and nonirrigated crops, wildlife habitat and range. Irrigated crops are

alfalfa and small grain. Small grain responds to nitrogen, and alfalfa responds to phosphate fertilizer. The cropping system used in dryfarmed areas is a wheat-fallow rotation. These soils are suitable for range seeding where this practice is needed.

Representative profile of Etta clay, heavy variant, 2.35 miles south of the Beaver-Millard County line and 2,100 feet west of U.S. Highway 91, sec. 13, T. 26 S., R. 7 W.

Ap—0 to 5 inches, dark-gray (10YR 4/1) light clay, very dark brown (10YR 2/2) when moist; strong, fine, granular structure; hard, firm, sticky and plastic; few fine roots; no pores; neutral (pH 6.8); abrupt, smooth boundary.

B2—5 to 15 inches, grayish-brown (10YR 5/2) light clay, very dark grayish brown (10YR 3/2) when moist; moderate, coarse, prismatic structure that parts to moderate, medium, angular blocky; extremely hard, very firm, very sticky and very plastic; few fine roots; few fine pores; neutral (pH 7.0); gradual, wavy boundary.

B3—15 to 38 inches, grayish-brown (10YR 5/2) light clay, very dark grayish brown (10YR 3/2) when moist; weak, coarse, prismatic structure; vertical dark-brown (10YR 3/3) streaks when moist; diffuse, wavy boundary.

IIC1—38 to 48 inches, pinkish-gray (5YR 6/2) clay loam, reddish brown (5YR 4/3) when moist; one-third of soil material is dark brown (7.5 YR 3/2); few, fine, faint, reddish-brown (5YR 4/4) mottles; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; few fine roots; few fine pores; neutral (pH 7.3); clear, smooth boundary.

IIC2—48 to 62 inches, light reddish-brown (5YR 6/3) sandy clay loam, dark reddish gray (5YR 4/2) when moist; many, fine, faint yellowish-red (5YR 5/6) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; slightly calcareous; mildly alkaline (7.4).

The A1 horizon has color hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 1 or 2. The B horizon, 10 to 20 inches thick, is light clay. It has color hue of 10YR or 7.5YR, value of 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. Some parts of the B horizon have moderate structure.

Etta clay, heavy variant (Ev).—This soil has slopes of 1 to 3 percent. Runoff is slow, and the hazard of erosion is slight. This soil is suitable for irrigated crops, dryfarmed crops, and watershed catchment. Capability unit IVe–UZ, nonirrigated, and IIIe–25, irrigated; Upland Loam range site.

Firmage Series

The Firmage series consists of deep, strongly sloping to steep, well-drained, very strongly calcareous soils on hills and mountains. These soils formed in colluvium and alluvium derived from limestone. Firmage soils are in Millard County, north and east of Antelope Point. They are associated with Oakden, Mill Hollow, and Ushar soils and Rock outcrop. Elevation ranges from 5,800 to 6,600 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation consists of big sagebrush, juniper, and cheatgrass.

In a representative profile the surface layer is light brownish-gray very cobbly loam about 8 inches thick. The upper 25 inches of the underlying layer is white, friable cobbly loam. The lower part is cobbly sandy loam.

The available water capacity is 5 to 5.5 inches in a 5-foot profile, and the water supplying capacity is 8 to 10 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, watershed catchment area, and woodland. Clearing and range seeding on these soils are marginal practices because rainfall is low. Range vegetation can be improved through good management.

Representative profile of Firmage very cobbly loam in an area of Firmage-Oakden association, 5 to 30 percent slopes, 5 miles east and 5 miles north of Antelope Point, three-fourths of a mile west of the southeast corner of sec. 22, T. 24 S., R. 8 W.

A1—0 to 8 inches, light brownish-gray (10YR 6/2) very cobbly loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots and few coarse roots; few, fine, tubular pores; strongly calcareous; moderately alkaline (pH 8.4); clear, wavy boundary.

C1ca—8 to 33 inches, white (10YR 8/2) cobbly loam, very pale brown (10YR 7/3) when moist; massive; weakly cemented, friable, slightly sticky and nonplastic; few, fine, medium, and coarse roots; few, fine, tubular pores; very strongly calcareous; strongly alkaline (pH 8.6); gradual, wavy boundary.

C2ca—33 to 60 inches, white (10YR 8/1) cobbly sandy loam, very pale brown (10YR 7/3) when moist; massive; weakly cemented, friable, slightly sticky and nonplastic; few fine and medium roots; few, fine, tubular pores; very strongly calcareous; strongly alkaline (pH 8.6).

The A1 horizon is 5 to 10 inches thick. It has color value of 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The C horizon, at depths between 10 and 40 inches, is cobbly loam or heavy loam. The content of coarse fragments is 20 to 40 percent. In places, below a depth of 10 to 40 inches, the soil material is cobbly sandy loam or sandy loam. The C horizon begins 7 to 11 inches below the surface and is 40 to 60 inches thick. It has color value of 8 when dry and 6 or 7 when moist and chroma of 1 or 2 when dry and 2 or 3 when moist.

Firmage-Oakden association, 5 to 30 percent slopes (FDF).—This mapping unit is about 60 percent Firmage very cobbly loam, 5 to 30 percent slopes, and 40 percent Oakden cobbly loam, 5 to 30 percent slopes, eroded. The Firmage soil is dominantly on the side slopes, and the Oakden soil is on ridgetops.

Both soils have the profile described as representative of their series. Included with this soil in mapping are small areas of deep soil that formed in alluvium and small areas of severely eroded Firmage soils.

These soils are used for range, wildlife habitat, and watershed catchment and have limited use as woodland. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Capability unit VIIs–U, nonirrigated; Firmage soil—Upland Limy Loam (Juniper-Pinyon) range site, Oakden soil—Upland Shallow Hardpan (Juniper-Pinyon) range site.

Flowell Series

The Flowell series consists of deep, gently sloping to steep, well-drained soils on hills, alluvial fans, and ter-

races. These soils formed in alluvium derived from intermediate igneous and quartzite material. Flowell soils occur throughout the eastern half of the survey area, mainly in foothill areas but also in mountainous terrain. They are associated with Ushar, Murdock, and Red Butte soils and the Ushar variant. Elevation ranges from 6,000 to 6,800 feet. Mean annual air temperature is 46° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper-pinyon, big sagebrush, bluebunch wheatgrass, Sandberg bluegrass, and snakeweed.

In a representative profile the surface layer is brown loam about 4 inches thick. The subsoil is brown, firm, heavy clay loam or clay about 20 inches thick. The substratum is pinkish-white, friable, very strongly calcareous loam.

Some of the Flowell soils are moderately eroded. The available water capacity is 10 to 12 inches in a 5-foot profile, and the water supplying capacity is 9 to 11 inches. Permeability is slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, watershed catchment, irrigated crops, and wildlife habitat. A small acreage is used for nonirrigated crops. Irrigated crops are alfalfa, small grain, and pasture plants. A wheat-fallow rotation is used in nonirrigated areas. These soils are suitable for clearing and range seeding where such practices are needed.

Representative profile of Flowell loam, 3 to 6 percent slopes, eroded, 4¾ miles north of Manderfield, NE¼NW¼ sec. 32, T. 27 S., R. 7 W.

A1—0 to 4 inches, brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) when moist; weak, fine, granular structure; soft, friable, slightly sticky and slightly plastic; abundant fine and medium roots; few, fine, tubular pores; mildly alkaline (pH 7.6); clear, smooth boundary.

B1t—4 to 10 inches, brown (7.5YR 5/2) clay loam, dark brown (7.5YR 3/3) when moist; weak, fine, angular blocky structure; very hard, firm, slightly sticky and plastic; common fine and medium roots; common, medium and fine, tubular pores; thin, continuous clay films; moderately alkaline (pH 7.8); gradual, smooth boundary.

B2t—10 to 24 inches, brown (7.5YR 5/4) light clay, dark brown (7.5YR 4/3) when moist; strong, coarse, angular blocky structure; extremely hard, firm, sticky and plastic; few fine and coarse roots; few, fine, tubular pores; moderate, continuous clay films; moderately alkaline (pH 8.2); gradual, wavy boundary.

Cca—24 to 60 inches, pinkish-white (7.5YR 8/2) loam, brown (7.5YR 5/4) when moist; massive; hard, friable, nonsticky and slightly plastic; few, fine and medium roots; common, fine and medium, tubular pores; very strongly calcareous; strongly alkaline (pH 8.7).

The A1 horizon is 2 to 6 inches thick. It has color hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 1 through 3. The B2t horizon is heavy clay loam to clay or silty clay. It has color hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry and 2 or 3 when moist. This horizon is 11 to 30 inches thick. Horizons of lime accumulation occur just below the B horizon. They are loam or sandy loam and are gravelly or sandy in places. In places the C horizon contains gravel.

Flowell loam, 3 to 6 percent slopes, eroded (FEC2).—This soil occurs on alluvial fans. It has the profile described as representative of the series. It is moderately eroded, and there are a few shallow gullies. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, wildlife habitat, and nonirrigated crops. Where the range vegetation is nearly a closed stand of juniper and pinyon and little or no understory, clearing and range seeding are practical because they control erosion and increase forage production. This unit is suitable for irrigation where water is available. Capability unit IVe–UZ, nonirrigated; Upland Loam (Juniper-Pinyon) range site.

Flowell gravelly loam, 3 to 6 percent slopes, eroded (FGC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is 20 to 50 percent gravel. Runoff is medium, and the hazard of erosion is moderate. Included with this soil in mapping are small areas of Pavant cobbly loam, 1 to 6 percent slopes, and areas of Rock outcrop.

This soil is used for range, watershed catchment, and wildlife habitat. This unit has some limitations for range seeding because it has a gravelly surface. Capability unit IVe–UZ, nonirrigated; Upland Loam (Juniper-Pinyon) range site.

Flowell association, 1 to 3 percent slopes (FIB).—This mapping unit is 60 percent Flowell loam, 1 to 3 percent slopes, and 40 percent Ushar silt loam, thick solum variant, 1 to 3 percent slopes. There is no pattern of occurrence.

The Flowell soil has a profile similar to the one described as representative of the series, but the surface layer is 2 to 4 inches thicker. The Ushar soil has the profile described as representative of the Ushar variant. These soils are gently sloping. Runoff is slow to medium, and the hazard of erosion is slight.

These soils are used for irrigated crops. Management of irrigation water is important. Flowell soil—capability unit IIIe–25, irrigated; Ushar variant—capability unit IIe–2, irrigated.

Flowell association, 3 to 6 percent slopes, eroded (FMC2).—This mapping unit is 60 percent Flowell loam, 3 to 6 percent slopes, eroded, and 40 percent Ushar silt loam, thick solum variant, 3 to 6 percent slopes, eroded. There is no pattern of occurrence. These gently sloping to sloping soils are on alluvial fans. This mapping unit is southeast of Manderfield in the North Creek area.

The Ushar soil has a profile similar to that described as representative of the Ushar variant, but the surface layer is about 3 inches thinner. These soils are moderately eroded. Runoff is medium, and the hazard of erosion is moderate. Included with these soils in mapping are small areas of Pharo loam and Pharo gravelly loam, 3 to 10 percent slopes, eroded.

These soils are used for range, watershed catchment, and wildlife habitat. They are suitable for clearing and range seeding where such practices are needed. These soils are suited to irrigated crops but are marginal for nonirrigated crops because rainfall is

low. Capability unit IVe–UZ, nonirrigated, Upland Loam (Juniper-Pinyon) range site.

Flowell-Ushar association, 3 to 30 percent slopes (FUF).—This mapping unit is 60 percent Flowell cobbly loam, 6 to 30 percent slopes, and 40 percent Ushar cobbly loam, 3 to 30 percent slopes, eroded. There is no uniformity in pattern of occurrence. These gently sloping to steep soils are on mountains and hills.

The Flowell soil has a profile similar to the soil described as representative of the series, but the surface layer is cobbly and is 20 to 40 percent cobbles. The Ushar soil has a profile similar to the one described as representative of the series, but the surface layer is 1 to 2 inches thinner and has 20 to 40 percent cobbles.

Runoff is medium to rapid, and the hazard of erosion is moderate to high.

These soils are used for range, watershed catchment, and wildlife habitat. They are not suited to crops because of the cobbly surface and the slope. They are suitable for clearing and seeding where such practices are needed. Capability unit VIe–U, nonirrigated; Upland Loam (Juniper-Pinyon) range site.

Flowell Variant

The Flowell variant consists of deep, moderately steep to very steep, well-drained soils on mountains. These soils formed in colluvium and alluvium derived from rhyolite tuff. They are on the mountain near the Beaver TV booster station. They are associated with Wallsburg soils. Elevation ranges from 7,200 to 7,800 feet. Mean annual air temperature is about 39° to 40° F, average annual precipitation is 18 to 20 inches, and the frost-free period is 65 to 85 days. The vegetation includes big sagebrush, Gambel oak, snowberry, bitterbrush, and tall native bluegrass.

In a representative profile the surface layer is grayish-brown cobbly loam about 10 inches thick. The subsoil is light-brown, firm, cobbly light clay about 21 inches thick. The underlying material is moderately calcareous, very cobbly loam. In places rhyolite tuff occurs below a depth of 40 inches.

Flowell variant soils are moderately eroded. The available water capacity is 5 to 7.5 inches in a 5-foot profile, and the water supplying capacity is 9 to 13 inches. Permeability is slow. Roots can penetrate to a depth of 40 to 60 inches or more.

These soils are used for range, wildlife habitat, and watershed catchment. They are suitable for brush management and clearing and range seeding on the gentler slopes where such practices are needed.

Representative profile of Flowell cobbly loam, cold variant, 30 to 60 percent slopes, eroded, on the mountain between Wild Canyon and Pine Creek, 9 miles north and 1 mile west of Manderfield; 0.3 mile west and 0.3 mile south of the northeast corner of sec. 8, T. 27 S., R. 7 W.

A1—0 to 10 inches, grayish-brown (10YR 5/2) cobbly loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; hard, friable, slightly sticky and slightly plastic; many fine and few medium roots; few, fine and medium, tubular pores; mildly alkaline (pH 7.4); clear, smooth boundary.

B2t—10 to 31 inches, light-brown (7.5YR 6/3) cobbly light clay, dark brown to brown (7.5YR 4/4) when moist; moderate, coarse, blocky structure that parts to moderate, fine, blocky; very hard, firm, sticky and plastic; few fine and medium roots; few, fine, tubular pores; moderate, continuous clay films; mildly alkaline (pH 7.6); gradual, wavy boundary.

C—31 to 72 inches, pinkish-gray (7.5YR 7/2) very cobbly loam, pinkish gray (7.5YR 6/2) when moist; massive; very hard, friable, slightly sticky and nonplastic; few fine and medium roots; few, fine and medium, tubular pores; moderately calcareous; moderately alkaline (pH 8.4).

The A1 horizon is 8 to 12 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 2. The B2t horizon ranges from cobbly heavy clay loam to cobbly light clay. It has color value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 through 4. Cobbles and a few stones make up 30 to 50 percent, by volume, of the upper part of the B2t horizon and as much as 70 percent of the lower part of the B2 horizon and the C horizon. Fractured volcanic tuff occurs below a depth of 40 inches in some places.

Flowell loam, cold variant, 10 to 30 percent slopes, eroded (FVF2).—This moderately steep to steep soil occurs on mountains. It has a profile similar to the one described as representative of the variant, but the surface layer is free of cobbles and bedrock occurs between depths of 40 and 60 inches. Included with this soil in mapping are areas of a soil that is similar to this Flowell variant soil, but bedrock occurs between depths of 20 and 40 inches.

Runoff is medium to rapid, and the hazard of erosion is moderate to high.

This soil is used for range, wildlife habitat, and watershed catchment. This mapping unit is suitable for clearing and range seeding and brush management where such practices are needed. Capability unit VIe–M; Mountain Gravelly Loam range site.

Flowell cobbly loam, cold variant, 30 to 60 percent slopes, eroded (FWG2).—This soil is steep and very steep and occurs on mountains. It has the profile described as representative of the variant. It is moderately eroded. Runoff is rapid, and the hazard of erosion is high. Included with this soil in mapping are areas of a coarse, very cherty loam that has 50 to 80 percent coarse fragments throughout the profile, which extends to a depth of 60 inches or more.

This soil is not suited to clearing and range seeding because it is steep. Capability unit VIIe–M, nonirrigated; Mountain Gravelly Loam range site.

Fruitland Series

The Fruitland series consists of deep, gently sloping and moderately sloping, well-drained soils on alluvial fans and flood plains. These soils formed in alluvium derived from mixed sedimentary and igneous material. Fruitland soils are in the alluvial valleys throughout the survey area. Elevation ranges from 5,200 to 5,900 feet. Mean annual air temperatue is 48° to 49° F, average annual precipitation is 10 to 12 inches, and the frost-free period is 105 to 115 days. The native

vegetation is big sagebrush, yellowbrush, cheatgrass, and Indian ricegrass.

In a representative profile the surface layer is pale-brown light loam about 7 inches thick. The upper part of the underlying material is pale-brown, very friable light loam or sandy loam about 53 inches thick. The lower part is light brownish-gray loam.

Fruitland soils are slightly to moderately eroded. The available water capacity is 6 to 9 inches in a 5-foot profile, and the water supplying capacity is 6 to 9 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, and irrigated crops. Clearing and range seeding practices are unsuccessful on these soils because rainfall is low. The vegetation can be improved through good management.

Representative profile of Fruitland loam, 1 to 3 percent slopes, 3 miles east of Adamsville on the south road, 1,200 feet north of the road and south of the river; sec. 34, T. 29 S., R. 8 W.

Ap—0 to 7 inches, pale-brown (10YR 6/3) light loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, granular structure; soft, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; moderately calcareous; mildly alkaline (pH 7.6); clear, smooth boundary.

C1—7 to 23 inches, pale-brown (10YR 6/3) light loam, dark brown (10YR 4/3) when moist; weak, medium, prismatic structure that parts to weak, medium, subangular blocky; soft, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; moderately calcareous; mildly alkaline (pH 7.7); clear, smooth boundary.

C2—23 to 48 inches, pale-brown (10YR 6/3) light loam, dark grayish brown (10YR 3.5/3) when moist; massive; soft, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; moderately calcareous; mildly alkaline (pH 7.7); clear, smooth boundary.

C3—48 to 60 inches, pale-brown (10YR 6/3) fine sandy loam, dark grayish brown (10YR 4/2) when moist; massive; soft, very friable, nonsticky and nonplastic; moderately calcareous; moderately alkaline (pH 8.0); clear, smooth boundary.

C4—60 to 70 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; calcareous; moderately alkaline (pH 8.0).

The A1 horizon is 5 to 8 inches thick. It has color value of 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The C horizon is sandy loam to light loam. In places some weak lime veining occurs in the lower part of the C horizon. Strata of sandy or gravelly material may occur below a depth of 24 inches in some places.

Fruitland loam, 1 to 3 percent slopes (FxB).—This gently sloping soil is on alluvial fans and flood plains. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate.

This soil is used mainly for irrigated crops of alfalfa, small grain, and silage corn. Capability unit VIIe–S, nonirrigated, and IIe–26, irrigated; Semidesert Loam range site.

Fruitland loam, 3 to 6 percent slopes (FxC).—This soil is similar to the one described as representative of the series, but it is more sloping. In many places drainageways that are 20 to 30 feet deep and 15 to 25 feet wide cut through areas of this soil. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

This soil is used for range, watershed catchment, and wildlife habitat. Capability unit VIIe–S, nonirrigated, and IIIe–26, irrigated; Semidesert Loam range site.

Fruitland loam, 1 to 6 percent slopes, eroded (FZC2).—This soil is similar to the one described as representative of the series, but slopes are 1 to 6 percent. Shallow gullies that are about 200 to 400 feet apart feed into gullies that are 20 to 30 feet deep and 15 to 25 feet wide. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

This mapping unit is used for range, watershed catchment, and wildlife habitat. Capability unit VIIe–S, nonirrigated; Semidesert Loam range site.

Hansel Series

The Hansel series consists of deep, gently sloping, well-drained soils on alluvial fans. These soils formed in alluvium derived from basic igneous material. Hansel soils are in the Pine Creek area west of areas used for farms. Elevation ranges from 6,000 to 6,200 feet. Mean annual air temperature is 46° to 48° F, average annual precipitation is 12 to 13 inches, and the frost-free period is 100 to 108 days. The vegetation is big sagebrush, yellowbrush, bluegrass, Indian ricegrass, juniper, and annual weeds.

In a representative profile, the surface layer is grayish-brown loam 2 inches thick. The upper 37 inches of the subsoil is light reddish-brown, firm clay loam or silty clay loam. The lower 25 inches is light reddish-brown, very firm silty clay. The substratum is light reddish-brown, firm, strongly calcareous silty clay.

Hansel soils are slightly eroded. Available water capacity is 11 to 12 inches in a 5-foot profile, and the water supplying capacity is 9 to 11 inches. Permeability is slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, watershed catchment, and wildlife habitat. They are suitable for clearing and seeding where such practices are needed.

Representative profile of Hansel loam, 1 to 3 percent slopes, 3 miles west and 5 miles south of Cove Fort; ½ mile south from the northeast corner of sec. 28, T. 26 S., R. 7 W.

A1—0 to 2 inches, grayish-brown (10YR 5/2) loam, dark brown (10YR 3/3) when moist; weak, thin, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; many fine and few medium roots; many, fine and few, medium tubular pores; moderately alkaline (pH 8.4); abrupt, smooth boundary.

B21t—2 to 8 inches, light reddish-brown (5YR 6/3) clay loam, reddish brown (5YR 4/3) when moist; weak, medium, blocky structure that parts to weak, fine, blocky; hard, firm, sticky and very plastic; many fine, medium, and coarse roots; many, fine, tubular pores; thin, continuous clay films; noncalcareous; moderately alkaline (pH 8/4); clear, smooth boundary.

B22tca—8 to 23 inches, light reddish-brown (5YR 6/3) silty clay loam, reddish brown (5YR 4/3) when moist; weak, medium, blocky structure that parts to weak, fine, blocky; very hard, firm, slightly sticky and very plastic; common fine and medium and few coarse roots; thin, continuous clay films; strongly calcareous; strongly alkaline (pH 8.6); clear, wavy boundary.

IIB23tca—23 to 39 inches, light reddish-brown (5YR 6/3) silty clay loam, reddish brown (5YR 4/3) when moist; weak, medium, blocky structure that parts to weak, fine, angular blocky; very hard, firm, sticky and plastic; few fine and medium roots; many, fine and medium, tubular pores; thin, patchy clay films; strongly calcareous; strongly alkaline (pH 8.6); clear, smooth boundary.

IIB24tca—39 to 64 inches, light reddish-brown (5YR 6/3) silty clay, reddish brown (5YR 5/3) when moist; moderate, coarse, prismatic structure that parts to strong, medium and fine, angular blocky; extremely hard, very firm, sticky and very plastic; few fine roots; few, fine and medium, tubular pores; moderate, continuous clay films; strongly calcareous; strongly alkaline (pH 8.6); abrupt, smooth boundary.

IIC—64 to 76 inches, light reddish brown (5YR 6/3) silty clay, reddish brown (5YR 4/3) when moist; massive; very hard, firm, sticky and very plastic; few, fine, tubular pores; few, fine, faint, yellowish-brown (10YR 5/8) mottles; slightly calcareous; moderately alkaline (pH 8.4).

The A1 horizon is 2 to 5 inches thick. It has color hue of 10YR or 7.5YR, value of 5 when dry and 3 when moist, and chroma of 2 or 3. The B2t horizon is more than 20 inches thick and ranges from clay loam to silty clay loam. It has color hue of 5YR or 7.5YR, value of 6 when dry and 4 or 5 when moist, and chroma of 3 or 4. The A and B2t horizons combined are more than 22 inches thick. A buried B horizon similar to the B2t horizon but strongly calcareous is below the B2t horizon in places. The C horizon is silty clay, loam, or clay loam.

In this survey area, Hansel soils are slightly redder than is within the defined range for the series. This difference does not alter the use and behavior of these soils.

Hansel loam, 1 to 3 percent slopes (HAB).—This soil has the profile described as representative of the series. It is used for range, wildlife habitat, and watershed catchment. Runoff is slow, and the hazard of erosion is slight. Capability unit IVe–UZ, nonirrigated; Upland Loam range site.

Hansel Variant

The Hansel variant consists of deep, gently sloping, well-drained soils on dissected terraces and outwash fans. These soils formed in alluvium derived from mixed igneous and sedimentary material. They are mainly to the north, west, and south of, and within 2 miles of, Manderfield. Elevation ranges from 5,800 to 6,000 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The native vegetation is big sagebrush, western wheatgrass, and Indian ricegrass.

In a representative profile the surface layer is light brownish-gray silt loam about 9 inches thick. The subsoil is light brownish-gray or light-gray, friable silty clay loam 16 inches thick. The underlying material is light-gray silt loam.

On Hansel variant soils the hazard of erosion is moderate. Available water capacity is 10 to 11 inches in a 5-foot profile, and the water supplying capacity is 9 to 11 inches. Permeability is moderately slow. Roots can penetate to a depth of 48 to 60 inches.

These soils are used for range, wildlife habitat, watershed catchment, and irrigated crops. Brush management and clearing and range seeding, where needed, have been successful.

Representative profile of Hansel silt loam, low lime variant, 1½ miles north of Manderfield and 150 feet west of U.S. Highway 91, NE¼ of sec. 16, T. 28 S., R. 7 W.

Ap—0 to 4 inches, light brownish-gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, thin, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; neutral (pH 7.0); abrupt, smooth boundary.

A12—4 to 9 inches, light brownish-gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) when moist; weak, coarse, prismatic structure that parts to weak, medium, subangular blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; few medium pores; slightly acid (pH 6.2); clear, wavy boundary.

B21t—9 to 16 inches, light brownish-gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) when moist; weak, medium, subangular blocky structure; hard, friable, sticky and plastic; few fine roots; few medium pores; thin clay films on some ped surfaces and in pores; neutral (pH 7.2); clear, smooth boundary.

B22t—16 to 25 inches, light-gray (10YR 7/2) silty clay loam, gray (10YR 5/1) when moist; moderate, coarse, blocky structure that parts to fine, blocky; hard, friable, sticky and plastic; few fine roots; few fine pores; moderately calcareous; moderately alkaline (pH 8.2); clear, smooth boundary.

C1—25 to 38 inches, light-gray (10YR 7/2) silt loam, dark grayish brown (10YR 4/2) when moist; few, fine, faint, brown (10YR 5/3) mottles; moderate, coarse, blocky structure that parts to medium, blocky; friable, slightly sticky and slightly plastic; few fine roots; slightly calcareous; moderately alkaline (pH 8.3); clear, smooth boundary.

C2—38 to 60 inches, light-gray (10YR 7/2) silt loam, dark brown to brown (10YR 4/3) when moist; common, medium, faint, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; friable, nonsticky and nonplastic; mildly alkaline (pH 7.8).

The A1 horizon is 8 to 11 inches thick. The B2t horizon has color value of 6 or 7 when dry and 4 or 5 when moist and chroma of 1 or 2. The A and B horizons are 20 to 30 inches thick. The C horizon is generally silt loam, but strata of coarser-textured materials occur in some places.

Hansel silt loam, low lime variant (He).—This gently sloping soil is on dissected terraces and outwash fans. Runoff is medium, and the hazard of erosion is moderate. Irrigated crops are alfalfa, small grain, pasture, and corn for silage. Capability unit IVe–UZ, nonirrigated, and IIe–2, irrigated; Upland Loam range site.

Haybourne Series

The Haybourne series consists of deep, gently sloping to strongly sloping, well-drained soils on alluvial fans. These soils formed in alluvium derived from granitic material. Haybourne soils are on alluvial fans that are adjacent to the west side of the Mineral Mountain Range on the Pass Canyon Road. Elevation

ranges from 5,100 to 5,900 feet. Mean annual air temperature is 48° to 49° F, average annual precipitation is 10 to 12 inches, and the frost-free period is 105 to 115 days. The vegetation is big sagebrush, cheatgrass, galleta, and annual weeds.

In a representative profile the surface layer is pale-brown coarse sandy loam and sandy clay loam about 9 inches thick. The subsoil is brown, friable coarse sandy clay loam about 20 inches thick. The underlying material is very pale brown loam and pale-brown coarse sandy loam overlying coarse sand.

Available water capacity is 5 to 6 inches in a 5-foot profile, and the water supplying capacity is 5 to 8 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, watershed catchment, and wildlife habitat. Range seeding is unsuccessful because rainfall is low. Range vegetation can be improved by good management.

Representative profile of Haybourne coarse sandy loam, 1 to 10 percent slopes, 1½ miles north from the Microwave Station on the Pass Canyon Road, ¼ mile south of northwest corner of sec. 18, T. 28 S., R. 9 W.

A11—0 to 3 inches, pale-brown (10YR 6/3) light coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; single grained; loose, nonsticky and nonplastic; very few fine roots; common, fine and medium, tubular pores; mildly alkaline (pH 7.4); abrupt, smooth boundary.

A12—3 to 6 inches, pale-brown (10YR 6/3) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft, friable, nonsticky and slightly plastic; few fine and medium roots; common, fine and medium, tubular pores; mildly alkaline, (pH 7.6); clear, smooth boundary.

A3—6 to 9 inches, brown (10YR 5/3) sandy clay loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure that parts to weak, fine, subangular blocky; hard, firm, slightly sticky and plastic; few fine and medium roots; few, fine and medium, tubular pores; mildly alkaline (pH 7.6); clear, smooth boundary.

B2—9 to 29 inches, brown (10YR 5/3) coarse sandy clay loam, brown to dark brown (10YR 4/3) when moist; weak, medium, subangular blocky structure that parts to weak, fine, subangular blocky; slightly hard, friable, nonsticky and slightly plastic; very few fine roots; few, fine, tubular pores; thin clay coatings on sand grains; mildly alkaline (pH 7.8); clear, smooth boundary.

C1—29 to 40 inches, very pale brown (10YR 7/4) light loam, dark yellowish brown (10YR 4/4) when moist; massive; hard, friable, nonsticky and plastic; few fine roots; few, fine, tubular pores; moderately calcareous; strongly alkaline (pH 8.8); gradual, wavy boundary.

C2—40 to 48 inches, pale-brown (10YR 6/3) coarse sandy loam, yellowish brown (10YR 5/4) when moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine roots; few, fine, tubular pores; moderately calcareous; strongly alkaline (pH 9.0); gradual, wavy boundary.

C3—48 to 60 inches, pale-brown (10YR 6/3) coarse sand, yellowish brown (10YR 5/4) when moist; single grained; loose, nonsticky and nonplastic; few fine roots; common fine and medium pores; moderately calcareous; very strongly alkaline (pH 9.2).

The A1 horizon is 3 to 10 inches thick. It has color value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The B2 horizon is coarse sandy clay loam to sandy clay loam. It has color hue of 10YR and 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 2 or 3. The C horizon is calcareous coarse sandy loam, loam, or coarse sand.

Haybourne coarse sandy loam, 1 to 10 percent slopes (HHD).—Included with this soil in mapping are small areas of Sheeprock soils and about 15 percent unnamed loamy sand. Runoff is medium, and the hazard of erosion is moderate to high. This soil is limited by erodibility, moderate water capacity, and low rainfall. Capability unit VIIe–S, nonirrigated; Semidesert Loam range site.

Hiko Peak Series

The Hiko Peak series consists of deep, gently sloping to steep, well-drained soils on alluvial fans, hills, and mountains. These soils formed in alluvium derived from basic and intermediate igneous and mixed sedimentary materials.

In several places Hiko Peak soils are at the lower elevations in the survey area. They are mainly in the area south of State Highway 21 from Greenville to Rocky Ford Dam. They occur as small areas along the Beaver River from Rocky Ford Dam to near the west boundary of the survey area. They also occur at the north end of the survey area west of Interstate 15, west of the irrigated fields that are 2 to 5 miles west of Beaver; and about 1 mile east of the Milford microwave station. They are associated with Decca, Escalante, Kessler, Penoyer, and Fruitland soils. Elevation ranges from 5,300 to 6,000 feet. Mean annual air temperature is 48° to 49° F, average annual precipitation is 10 to 12 inches, and the frost-free period is 105 to 115 days. The vegetation is big sagebrush, Indian ricegrass, squirreltail, and annual grasses and weeds.

In a representative profile the surface layer is light brownish-gray cobbly loam 2 inches thick. The subsoil is pale-brown loam about 7 inches thick. The upper 25 inches of the underlying layer is light-gray or pale-brown, friable gravelly loam or gravelly sandy loam. The lower part of the underlying layer is gray, loose very gravelly loamy coarse sand. Horizons of strong lime accumulation occur at a depth of 9 inches.

On Hiko Peak soils, the hazard of erosion is moderate. Available water capacity is 3 to 4 inches in a 5-foot profile, and the water supplying capacity is 5 to 8 inches. Permeability is moderately rapid. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, watershed catchment, and wildlife habitat. They are not suitable for clearing and range seeding because precipitation is low. Range vegetation can be improved by good management.

Representative profile of Hiko Peak cobbly loam, 2 to 10 percent slopes, 1 mile east of Rocky Ford Dam, sec. 12, T. 30 S., R. 9 W.

A1—0 to 2 inches, light brownigh-gray (10YR 6/2) cobbly loam, dark brown (10YR 3/3) when moist; weak, thin, platy structure; slightly hard, friable, slightly sticky and plastic; few fine roots; common, fine, vesicular pores; moderately calcareous; moderately alkaline (pH 8.4); abrupt, smooth boundary.

B2—2 to 9 inches, pale-brown (10YR 6/3) loam, dark yellowish brown (10YR 3/4) when moist; weak, medium, prismatic structure that parts to weak, fine, subangular blocky; slightly hard, friable, slightly sticky and plastic; common fine and medium and few coarse roots; few, fine, tubular pores; moderately calcareous; moderately alkaline (pH 8.2); abrupt, smooth boundary.

C1ca—9 to 20 inches, light-gray (10YR 7/2) gravelly loam, grayish brown (10YR 5/2) when moist; massive; weakly cemented; friable, slightly sticky and slightly plastic; common fine and few medium roots; common, fine, tubular pores; very strongly calcareous; strongly alkaline (pH 8.5); clear, smooth boundary.

C2ca—20 to 34 inches, pale-brown (10YR 6/3) gravelly sandy loam, brown (10YR 5/3) when moist; massive; hard, very friable, slightly sticky and nonplastic; common fine and few medium roots; few, fine, tubular pores; very strongly calcareous; strongly alkaline (pH 8.6); abrupt, smooth boundary.

IIC3—34 to 60 inches, gray (10YR 5/1) very gravelly loamy coarse sand, dark gray (10YR 4/1) when moist; single grained; loose, nonsticky and nonplastic; very few fine roots; interstitial pores; slightly calcareous; moderately alkaline (pH 8.4).

The A1 horizon is 2 to 4 inches thick. It has color hue of 10YR or 7.5YR, value of 6 when dry and 3 or 4 when moist, and chroma of 2 or 3. The C horizon, between depths of 10 and 40 inches, is gravelly or very gravelly loam or sandy loam. It has color value of 6 or 7 when dry and 5 when moist and chroma of 2 or 3. The Cca horizon is 7 to 12 inches below the surface and is 20 to 50 inches thick. The C horizon is 30 to 80 percent gravel and cobbles.

Hiko Peak coarse sandy loam, 3 to 30 percent slopes (HIF).—This soil has a profile similar to the one described as representative of the series, but the surface layer lacks cobbles and is coarse sandy loam instead of loam.

Included with this soil in mapping are small areas of a gravelly soil that is similar to the Hiko Peak soil, but it is noncalcareous throughout and is deep, medium-textured, and affected by alkali. Some wet areas are 1 to 5 acres in size. These areas are meadows along the Beaver River. In these areas, the soils are deep, medium textured to moderately fine textured, and somewhat poorly drained and poorly drained.

Runoff is medium, and the hazard of erosion is moderate. Capability unit VIIs–S, nonirrigated; Semidesert Stony Loam range site.

Hiko Peak cobbly loam, 2 to 10 percent slopes (HKD).—This gently sloping to sloping soil is on rolling hills. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate. Capability unit VIIs–S, nonirrigated; Semidesert Stony Loam range site.

Hiko Peak-Decca association, 1 to 15 percent slopes (HPE).—This mapping unit is 60 percent Hiko Peak gravelly sandy loam, 1 to 15 percent slopes, and 40 percent Decca loam, 3 to 15 percent slopes. These soils are rolling. The Hiko Peak soil is on the ridges and upper side slopes. The Decca soil is on lower side slopes and in the more nearly flat areas between the ridges.

The Hiko Peak soil has a profile similar to the one described as representative of the Hiko Peak series, but the surface layer is gravelly sandy loam. The Decca soil has a profile similar to the one described as representative of the Decca series, but the surface layer is only 1 to 3 inches thick. Runoff is medium, and the hazard of erosion is moderate.

These soils are used for range, wildlife habitat, and watershed catchment. They are not suitable for clearing and range seeding because precipitation is low. Capability unit VIIs–S, nonirrigated; Semidesert Stony Loam range site.

Hiko Peak-Fruitland association, 1 to 15 percent slopes (HRE).—This mapping unit is 60 percent Hiko Peak gravelly sandy loam, 1 to 15 percent slopes, and 40 percent Fruitland loam, 1 to 3 percent slopes. The Hiko Peak soil is on the rolling hills. The Fruitland soil is in small alluvial valleys between the hills and ridges.

The Hiko Peak soil has a profile similar to the one described as representative of the Hiko Peak series, but the surface layer is gravelly sandy loam. The Fruitland soil has the profile described as representative of the Fruitland series.

One small area of this mapping unit, dominantly Fruitland soil, is used for nonirrigated crops. The rest is used for range, wildlife habitat, and watershed catchment. Because precipitation is low, the use of these soils for nonirrigated crops is marginal and clearing and range seeding are not practical. Hiko Peak soil—capability unit VIIs–S, nonirrigated, Semidesert Stony Loam range site; Fruitland soil—capability unit VIIe–S, nonirrigated, Semidesert Loam range site.

James Canyon Series

The James Canyon series consists of deep, gently sloping, poorly drained soils on alluvial valley bottoms. These soils formed in alluvium derived from intermediate igneous and some sedimentary material. James Canyon soils are mainly along the Beaver River east of Greenville and southwest of Beaver. Elevation ranges from 5,700 to 6,000 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 11 to 13 inches, and the frost-free period is 100 to 108 days. The present vegetation includes meadow grasses, red clover, and sedges.

In a representative profile the surface layer is black and dark-gray silt loam about 28 inches thick. The upper 28 inches of the underlying layer is gray and dark-gray loam and silt loam. The lower part of the underlying layer, extending to a depth of 60 inches, is gray sandy loam.

On James Canyon soils the hazard of erosion is slight. Available water capacity is 7.5 to 10 inches in a 5-foot profile. Permeability is moderately slow. Roots can penetrate to a depth of more than 5 feet. The water table ranges from near the surface to about 30 inches below the surface, depending on the season and the amount of water applied to this and adjacent soils.

Most areas are used for meadow hay or pasture, but a few small areas are used for alfalfa or small grain. If not drained these soils are suited mainly to pasture or meadow hay. If drained, they are suited to all locally grown crops.

Representative profile of James Canyon silt loam, 1 to 3 percent slopes, 1¼ miles south of Beaver Post Office on State Highway 91, 100 feet west of highway, sec. 28, T. 29 S., R. 7 W.

A11—0 to 16 inches, dark-gray (10YR 4/1) silt loam, black (10YR 2/1) when moist; weak, medium, granular structure; hard, friable, sticky and plastic; many fine roots; common, fine, discontinuous, random, tubular pores; mildly alkaline (pH 7.4); abrupt, smooth boundary.

A12—16 to 28 inches, gray (10YR 5/1) heavy silt loam, black (10YR 2/1) when moist; 15 percent of the soil mass is dark-gray (5Y 4/1) mottles; massive; hard, friable, sticky and plastic; few fine roots; few, fine, discontinuous, random, tubular pores; mildly alkaline (pH 7.4); abrupt, smooth boundary.

C1—28 to 32 inches, gray (10YR 5/1) loam, very dark gray (10YR 3/1) when moist; massive; hard, friable, sticky and plastic; few fine roots; few, fine, discontinuous, random, tubular pores; mildly alkaline (pH 7.6); clear, smooth boundary.

C2—32 to 56 inches, dark-gray (10YR 4/1) silt loam, black (10YR 2/1) when moist; massive; hard, friable, sticky and plastic, very few fine roots; few, fine, random, tubular pores; mildly alkaline (pH 7.4); clear, smooth boundary.

C3–56 to 60 inches, gray (10YR 5/1) sandy loam; very dark gray (10YR 3/1) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few, fine, random, tubular pores; mildly alkaline (pH 7.6).

The A1 horizon is 10 to 28 inches thick. It has color value of 4 or 5 when dry and 2 when moist. The C horizon is loam, silt loam, or sandy loam, but is dominantly silt loam. Gravelly sand or gravelly sandy loam occur below a depth of 30 inches in some places. This horizon has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 1 or 2. Where chroma is 2, the soil is mottled.

James Canyon silt loam, 1 to 3 percent slopes (JcB).—This soil has the profile described as representative of the series. It is used mainly for meadow hay or pasture. If drained, this soil is suited to all locally grown crops. Runoff is slow, and the hazard of erosion is slight. Capability unit Vw–2, irrigated.

James Canyon silt loam, strongly saline, 1 to 3 percent slopes (JeB).—This soil has a profile similar to the one described as representative of the series, but the subsoil is gravelly below a depth of 30 inches in most places and below a depth of 20 inches in some places. Where drained and leached, this soil holds about 7.5 inches of available water in a 5-foot profile. Runoff is slow, and the hazard of erosion is slight.

Because the soil contains salts, there is only about 2 inches of available water. If drained and leached of salts, this soil is suited to locally grown crops. Capability unit Vw–27, irrigated.

James Canyon Calcareous Variant

The James Canyon calcareous variant consists of deep, gently sloping, somewhat poorly drained soils on flood plains and river terraces. These soils formed in alluvium derived from igneous and sedimentary material. They are south and west of Beaver and extend toward Adamsville. Elevation ranges from 5,700 to 6,000 feet. Mean annual air temperature is 45° to 48° F; average annual precipitation is 11 to 13 inches; and the frost-free period is 100 to 108 days. The present vegetation is meadow grasses and clovers.

In a representative profile the surface layer is dark-gray loam about 16 inches thick. The underlying layer is dark grayish-brown or light brownish-gray loam that extends to a depth of 60 inches. Horizons of strong lime accumulation are within 10 to 16 inches of the surface.

On the James Canyon calcareous variant, the hazard of erosion is slight. Available water capacity is 7.5 to 10 inches in a 5-foot profile. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet. The water table is generally at a depth of about 24 to 36 inches, but it fluctuates, depending on the amount of irrigation water applied to these and adjacent soils.

These soils are used for meadow hay and pasture and in some better drained areas, irrigated crops. If these soils are drained and the ground water level is controlled, they are well suited to all locally grown crops.

Representative profile of James Canyon loam, calcareous variant, ½ mile south and ½ mile west of the Beaver Post Office, 400 feet northwest of the road, sec. 21, T. 29 S., R. 7 W.

A11—0 to 4 inches, dark-gray (10YR 4/1) loam, black (10YR 2/1) when moist; moderate, medium and fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; few fine pores; strongly calcareous; moderately alkaline (pH 8.0); clear, wavy boundary.

A12—4 to 16 inches, dark-gray (10YR 4/1) loam, very dark brown (10YR 2/2) when moist; weak, prismatic structure that parts to fine, subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; few fine pores; strongly calcareous; moderately alkaline (pH 8.0); clear, wavy boundary.

ACca—16 to 43 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; weak, medium, prismatic structure that parts to medium, granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; strongly calcareous; moderately alkaline (pH 8.0); clear, wavy boundary.

C—43 to 60 inches, light brownish-gray (10YR 6/2) loam, very dark gray (10YR 3/1) when moist; few, fine, faint, very dark brown (10YR 2/3) mottles; massive; slightly hard, friable, sticky and plastic; few fine roots; no pores; slightly calcareous; mildly alkaline (pH 7.7).

The A1 horizon is 10 to 20 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 1 or 2. Faint mottles may occur between depths of 24 and 40 inches. The C horizon is loam or sandy clay loam. Depth to the horizon of lime accumulation is 10 to 16 inches. This horizon is 10 to 30 inches thick. The texture below a depth of 20 inches ranges from clay loam to gravelly sandy loam, and in places it is gravelly sand.

James Canyon loam, calcareous variant (Jm).—This soil has slopes of 1 to 3 percent. It is used for meadow hay, pasture, and irrigated crops. It is somewhat limited by a high water table. If drained, it is suited to all locally grown crops. Runoff is slow, and the hazard of erosion is slight. Capability unit IIw–2, irrigated.

James Canyon Heavy Variant

The James Canyon heavy variant consists of deep, gently sloping, poorly drained soils on flood plains and river terraces. These soils formed in alluvium derived from sedimentary and igneous material. They are in

the area between Beaver and Greenville. Elevation ranges from 5,700 to 6,000 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 11 to 13 inches, and the frost-free period is 100 to 108 days. The vegetation is meadow grasses and sedges.

In a representative profile the surface layer is covered with about 4 inches of meadow sod. The surface layer is grayish brown and dark gray silty clay loam about 17 inches thick. The subsoil, about 17 inches thick, is light gray, silty clay loam that has prominent or distinct mottles. The substratum is gray silty clay.

On James Canyon heavy variant, the hazard of erosion is slight. The available water capacity is about 11 inches in a 5-foot profile. Permeability is slow. Roots can penetrate to a depth of 60 inches. The water table ranges from near the surface to about 20 inches below the surface.

These soils are used mainly for pasture. They are difficult to drain because of their slow permeability. If partly drained and carefully irrigated, these soils are suitable for improved pasture and grain or cultivated crops.

Representative profile of James Canyon silty clay loam, heavy variant, 1 mile west and ¼ mile south of Beaver Post Office, 250 feet northwest of road corner, sec. 21, T. 29 S., R. 8 W.

O1—4 inches to 0, very dark grayish-brown to dark grayish-brown (10YR 4/2) meadow sod and some calcareous silty clay loam sediment.

A11—0 to 7 inches, grayish-brown (10YR 5/2) silty clay loam, black (10YR 2/1) when moist; very weak, coarse, prismatic structure that parts to moderate, thin, platy; very hard, firm, sticky and plastic; fine roots; few, fine, tubular pores; strongly calcareous; mildly alkaline (pH 7.8); clear, wavy boundary.

A12—7 to 17 inches, dark-gray (10YR 4/1) silty clay marginal to silty clay loam, black (10YR 2/1) when moist; moderate, fine, subangular blocky structure that parts to moderate, fine, granular; very hard, firm, sticky and plastic; common fine roots; few, fine, tubular pores; moderately calcareous; mildly alkaline (pH 7.6); clear, wavy boundary.

B2—17 to 34 inches, light-gray (2.5Y 7/1) silty clay loam, gray (2.5Y 5/1) when moist; common, fine, prominent, faint, gray (N 5/0) mottles; moderate, medium, subangular blocky structure; hard, firm, sticky and plastic; few fine roots; few fine pores; slightly calcareous; moderately alkaline (pH 8.0); abrupt, smooth boundary.

C—34 to 60 inches, gray (2.5Y 5/1) silty clay that is marginal to silty clay loam, dark gray (5Y 4/1) when moist; strongly mottled with green when moist but with light yellowish brown when dry; massive; sticky and plastic; slightly calcareous; mildly alkaline (pH 7.7).

In places the organic horizon at the surface is lacking. The A1 horizon is 10 to 18 inches thick. It has color value of 4 or 5 when dry and 2 when moist and chroma of 1. The 10- to 40-inch zone has color hues of 10YR or 2.5Y, value of 5 to 7 when dry and 2 to 5 when moist, and chroma of 1 or less. This layer is heavy silty clay loam, silty clay loam, or silty clay, and the strata range from loam to silty clay loam. Prominent mottles are generally present above a depth of 20 inches.

James Canyon silty clay loam, heavy variant (Jn).—This soil has the profile described as representative of the variant. Slopes are 1 to 3 percent. Runoff is slow, and the hazard of erosion is slight.

This soil is used for pasture. It can be improved by drainage. Capability unit Vw–2, irrigated.

James Canyon silty clay loam, heavy variant, saline (Jo).—This soil has a profile similar to the one described as representative of the variant, but enough salts have accumulated to moderately affect plant growth. About 15 percent of this mapping unit is Poganeab silty clay loam, deep over clay soils.

Available water capacity is about 11 inches in a 5-foot profile, but because of the salinity only 6 to 8 inches of moisture is readily available. Drainage is needed before the salts can be successfully leached out. Runoff is slow, and the hazard of erosion is slight. This soil is used for pasture. Drainage is possible but difficult. Capability unit Vw–27, irrigated.

Kersick Series

The Kersick series consists of shallow, moderately sloping to steep, well-drained soils on mountains and ridges. These soils formed in residuum weathered from limestone and calcareous sandstone. Kersick soils are in the northeastern part of the survey area. Elevation ranges from 5,600 to 6,200 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, mountainmahogany, cliffrose, and big sagebrush.

In a representative profile the surface layer is brown and yellowish-brown cobbly loam about 8 inches thick. The underlying layer is pale-brown, friable cobbly loam. Limestone bedrock is at a depth of about 17 inches.

On Kersick soils, the hazard of erosion is moderate. The available water capacity is about 2 inches above the bedrock, and the water supplying capacity is 5 to 8 inches. Permeability is moderate. Roots can penetrate to the bedrock.

These soils are used for range, wildlife habitat, and watershed catchment, and they have limited use as woodland. They are not suitable for range seeding because they are shallow to bedrock. Vegetation can be improved by using good range management.

Representative profile of Kersick cobbly loam, 5 to 30 percent slopes, 7½ miles north and ¾ mile east of Cove Fort; ¼ mile south and ⅛ mile west from the northeast corner of sec. 19, T. 24 S., R. 6 W.

A11—0 to 4 inches, brown (10YR 5/3) cobbly loam, dark brown (10YR 3/3) when moist; weak, thin, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and plastic; common fine and medium roots; common, fine and medium, tubular pores; moderately calcareous; moderately alkaline (pH 8.3); clear, smooth boundary.

A12—4 to 8 inches, yellowish-brown (10YR 5/4) cobbly loam, dark yellowish brown (10YR 3/4) when moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky and plastic; common fine and medium roots; common, fine and medium, tubular pores; strongly calcareous; moderately alkaline (pH 8.2); gradual, irregular boundary.

C—8 to 17 inches, pale-brown (10YR 6/3) cobbly loam, brown to dark brown (10YR 4/3) when moist; massive; hard, friable, slightly sticky and plastic;

plentiful medium and fine roots; no visible pores; strongly calcareous; moderately alkaline (pH 8.2); clear, wavy boundary.
R—17 inches, limestone.

The A1 horizon is 6 to 9 inches thick. It has color hue of 10YR and 7.5YR, value of 5 when dry and 3 when moist, and chroma of 2 through 4. The C horizon is cobbly loam or cobbly heavy sandy loam. It has color hue of 10YR and 7.5YR, value of 5 or 6 when dry and 4 when moist, and chroma of 3 or 4. Depth to bedrock ranges from 10 to 20 inches.

Kersick very rocky loam, 5 to 30 percent slopes (KCF).—This mapping unit is 80 percent Kersick cobbly loam, 5 to 30 percent slopes, and 20 percent Rock outcrop. Kersick soils are on the sides of mountains, and Rock outcrop is on the mountain ridgetops.

The Kersick soil has the profile described as representative of the series. Runoff is rapid, and the hazard of erosion is high. Included are small areas that are steeper.

This soil is not suited to clearing and range seeding because it is shallow and part of the unit is Rock outcrop. It is used as range, wildlife habitat, watershed catchment, and woodland. Kersick soil—capability unit VIIs–U, nonirrigated, Upland Stony Hills (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Kessler Series

The Kessler series consists of deep, gently sloping to steep, well-drained soils on hills. These soils formed in alluvium derived from basaltic material. Kessler soils are west of Cove Fort. They are associated with Hiko Peak, Fruitland, and Antelope Springs soils. Elevation ranges from 5,600 to 6,100 feet. Mean annual air temperature is 48° to 49° F, average annual precipitation is 10 to 12 inches, and the frost-free period is 100 to 115 days. The vegetation is big sagebrush, Indian ricegrass, squirreltail, and needleandthread.

In a representative profile the surface layer is light-gray very cobbly loam and pale-brown loam about 8 inches thick. The upper 30 inches of the underlying layer is very pale brown, friable silt loam, and the lower part is light yellowish-brown, friable loam. Horizons of strong lime accumulation occur at a depth of 6 to 10 inches and are 25 to 35 inches thick.

On Kessler soils, the hazard of erosion is slight to moderate. The available water capacity is 8 to 10 inches in a 5-foot profile, and the water supplying capacity is 4 to 6 inches. Permeability is moderate. Roots can penetrate to a depth of about 60 inches or more.

These soils are used for range, wildlife habitat, and watershed catchment. They are not suitable for clearing and range seeding because rainfall is low.

Representative profile of Kessler very cobbly loam, 1 to 10 percent slopes, in an area of Kessler Penoyer association, 1 to 20 percent slopes, 7 miles west and 1 mile south of Cove Fort, 0.5 mile north and 0.1 mile west of the southeast corner of sec. 36, T. 25 S., R. 8 W.

A11—0 to 3 inches, light-gray (10YR 7/2) very cobbly loam, dark grayish brown (10YR 4/2) when moist; weak, thin, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; many, fine and medium, vesicular pores; strongly calcareous; strongly alkaline (pH 8.7); abrupt, smooth boundary.
A12—3 to 8 inches, pale-brown (10YR 6/3) loam, brown to dark brown (10YR 4/3) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; few, fine, medium, and coarse roots; few, fine, medium, and coarse, tubular pores; strongly calcareous; strongly alkaline (pH 8.6); clear, wavy boundary.
C1ca—8 to 20 inches, very pale brown (10YR 8/3) heavy silt loam, pale brown (10YR 6/3) when moist; massive; weakly cemented, friable, slightly sticky and plastic; very few fine and medium roots; few, medium and fine, tubular pores; very strongly calcareous; strongly alkaline (pH 9.0); clear, wavy boundary.
C2ca—20 to 38 inches, very pale brown (10YR 7/3) heavy silt loam, light yellowish brown (10YR 6/4) when moist; massive; hard, friable, slightly sticky and plastic; very few fine roots; few, medium and fine, tubular pores; very strongly calcareous; strongly alkaline (pH 8.8); gradual, wavy boundary.
C3—38 to 60 inches, light yellowish-brown (10YR 4/4) loam, dark yellowish brown (10YR 4/4) when moist; massive; hard, friable, slightly sticky and slightly plastic; no roots; few, medium and fine, tubular pores; moderately calcareous; moderately alkaline (pH 8.4).

The A1 horizon is 3 to 10 inches thick. It has color value of 6 or 7 when dry and 4 when moist and chroma of 2 or 3. The C horizon, between depths of 10 and 40 inches, ranges from loam to silt loam. It has color value of 7 or 8 when dry and 5 or 6 when moist and chroma of 3 or 4. The horizon of lime accumulation occurs between depths of 6 and 10 inches and is 25 to 35 inches thick. In some places, below a depth of 36 inches, the C horizon is very cobbly or very stony.

Kessler loam, 1 to 10 percent slopes (KED).—This soil has a profile similar to the one described as representative of the series, but the surface layer is less than 15 percent cobbles and is generally 1 to 2 inches thicker. It is gently sloping to rolling. Included in mapping are small areas of Penoyer silt loam, 1 to 3 percent slopes. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for range, watershed catchment, and wildlife habitat. It is not suitable for range seeding because rainfall is low. Capability unit VIIe–S, nonirrigated; Semidesert Limy Loam range site.

Kessler cobbly loam, 3 to 20 percent slopes (KLE).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only 20 to 50 percent cobbles. It is gently sloping to steep and occurs on rolling hills. Included in mapping are small areas of Antelope Springs loam, 1 to 3 percent slopes, eroded; Mill Hollow cobbly loam, 5 to 30 percent slopes; Firmage very cobbly loam, 5 to 30 percent slopes; and areas of Rock outcrop.

This soil is used for range, watershed catchment, and wildlife habitat. It is not suitable for range seeding because rainfall is low and the soil has a cobbly surface. Capability unit VIIe–S, nonirrigated; Semidesert Limy Loam range site.

Kessler-Hiko Peak association, 1 to 20 percent slopes (KME).—This mapping unit is about 60 percent Kessler very cobbly loam, 1 to 10 percent slopes; 35 percent Hiko Peak very cobbly loam, 3 to 20 percent slopes;

and 5 percent Rock outcrop. There is no definite pattern of occurrence of these soils. The Hiko Peak soil has a profile similar to the one described as representative of the series but its surface layer is very cobbly and has 50 to 70 percent coarse fragments. Runoff is medium, and the hazard of erosion is moderate.

This mapping unit is used for range, watershed catchment, and wildlife habitat. It is not suitable for clearing and range seeding because rainfall is low, the soil has a very cobbly surface, and part of the unit is Rock outcrop. Kessler soil—capability unit VIIs–S, nonirrigated, Semidesert Limy Loam range site; Hiko Peak soil—capability unit VIIs–S, nonirrigated, Semidesert Stony Loam range site; Rock outcrop—capability unit VIIIs–X.

Kessler-Penoyer association, 1 to 20 percent slopes (KPE).—This mapping unit is about 50 percent Kessler very cobbly loam, 1 to 10 percent slopes; 30 percent Hiko Peak very cobbly loam, 3 to 20 percent slopes; 15 percent Penoyer silt loam, 1 to 3 percent slopes; and 5 percent Rock outcrop. The Kessler and Hiko Peak soils are on the rolling hills and ridges, and Penoyer soils are on the nearly level flood plains.

The Kessler soil has the profile described as representative of the series. Hiko Peak soil has a profile similar to the one described as representative of the Hiko Peak series, but the surface layer is very cobbly and 50 to 70 percent coarse fragments. Runoff is medium, and the hazard of erosion is moderate.

These soils are used for range, watershed catchment, and wildlife habitat. They are not suitable for clearing and range seeding because rainfall is low, the soil has a very cobbly surface, and part of the unit is Rock outcrop. Kessler and Hiko Peak soils—capability unit VIIs–S, nonirrigated; Kessler soil—Semidesert Limy Loam range site; Hiko Peak soil—Semidesert Stony Loam range site; Penoyer soil—capability unit VIIe–S, nonirrigated, Semidesert Silt Loam range site.

Manderfield Series

The Manderfield series consists of deep, gently sloping and moderately sloping, well-drained soils on alluvial fans and outwash plains. These soils formed in alluvium derived from mixed igneous material and quartzite. Manderfield soils are mainly in the southeastern quarter of the survey area, in the general vicinity of Beaver and Manderfield. Elevation ranges from 5,800 to 6,200 feet. Mean annual air temperature is 46° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, pinyon, big sagebrush, and bluebunch wheatgrass, but in some areas juniper and pinyon completely dominate the vegetation.

In a representative profile the surface layer is brown loam about 5 inches thick. The subsoil is brown, firm light clay loam and pale-brown gravelly loam about 19 inches thick. The underlying layer is pale-brown very gravelly loamy sand.

Some of the Manderfield soils are slightly to moderately eroded. The available water capacity is 3 to 5 inches in a 5-foot profile, and the water-supplying capacity is 8 to 9 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, watershed catchment, and irrigated crops and pasture. Areas used for range are suitable for brush management, clearing, and range seeding where such practices are needed.

Representative profile of Manderfield loam, 1 to 3 percent slopes, 1.35 miles north of Beaver Post Office on U.S. Highway 91, 115 feet west of highway; SE¼SE¼ sec. 9, T. 29 S., R. 7 W.

Ap—0 to 5 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; moderate, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine roots; no pores; neutral (pH 7.3); abrupt, smooth boundary.

B2t—5 to 16 inches, brown (10YR 5/3) light clay loam, dark brown (10YR 3/3) when moist; weak, medium, to moderate, fine, subangular blocky structure; hard, friable, sticky and plastic; common fine roots; many, medium, tubular pores; thin, patchy clay films; mildly alkaline (pH 7.6); abrupt, wavy boundary.

B3—16 to 24 inches, pale-brown (10YR 6/3) gravelly loam, dark brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; hard, firm, sticky and plastic; fine roots; moderately calcareous, soft secondary lime accumulations in the soil mass and as coatings on gravel; moderately alkaline (pH 8.3); clear, wavy boundary.

IIC—24 to 60 inches, pale-brown (10YR 6/3) very gravelly loamy sand; dark brown (10YR 4/3) when moist; massive; nonsticky and nonplastic; very few fine roots; moderately calcareous, lime coatings on gravel; strongly alkaline (pH 8.5); clear, wavy boundary.

The A horizon is 2 to 10 inches thick. It has color hue of 10YR or 7.5YR, value of 5 when dry and 3 when moist, and chroma of 2 or 3. The B2t horizon is 10 to 20 inches thick. It is heavy loam or clay loam in the upper part, and gravelly heavy loam or clay loam in the lower part. This horizon has color hue of 7.5YR or 10YR, value of 5 when dry and 3 when moist, and chroma of 2 through 4. The C horizon is gravelly or very gravelly loamy sand or sand. Lime coatings on the gravel occur just below the B2t horizon in places.

Manderfield loam, 1 to 3 percent slopes (MaB).—This soil is gently sloping and occurs on alluvial fans and outwash plains. It has the profile described as representative of the series. The soil is slightly eroded and has an available water capacity of about 3.5 to 4 inches. Runoff is slow, and the hazard of erosion is slight.

This soil is used for irrigated crops, wildlife habitat, watershed catchment, and range. Irrigated crops are alfalfa, small grain, and pasture. Capability unit VIs–U, nonirrigated, and IIIs–24, irrigated; Upland Stony Loam range site.

Manderfield loam, 3 to 6 percent slopes (MaC).—This soil has a profile similar to the one described as representative of the series. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, wildlife habitat, watershed catchment, and irrigated crops. Alfalfa hay, small grain, and pasture are the principal crops. Capability unit VIs–U, nonirrigated, and IIIs–24 irrigated; Upland Stony Loam range site.

Manderfield loam, 1 to 3 percent slopes, eroded (MBB2).—This soil has a profile similar tc the one

described as representative of the series, but the surface layer is only about 2 inches thick. This soil is moderately eroded. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, wildlife habitat, watershed catchment, and, to a limited extent, woodland. Because the juniper and pinyon pine are in nearly closed stands, there is little understory vegetation to control erosion. Clearing, seeding, and proper use of the soil improve vegetation cover, control soil erosion, and increase forage production. Capability unit VIs–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Manderfield loam, moderately deep over gravel, 1 to 3 percent slopes (McB).—This soil has a profile similar to the one described as representative of the series, but it is about 12 inches deeper to very gravelly loamy sand. Runoff is slow, and the hazard of erosion is slight.

This soil is used for irrigated crops of alfalfa hay, small grain, and pasture. Capability unit IIIs–24, irrigated.

Manderfield gravelly loam, 1 to 3 percent slopes (MdB).—This soil has a profile similar to the one described as representative of the series, but the surface layer is 25 to 40 percent gravel. Runoff is slow, and the hazard of erosion is slight.

This soil is used for range, wildlife habitat, watershed catchment, and irrigated crops. The crops are alfalfa hay, small grain, and pasture. Capability unit VIs–U, nonirrigated, and IVs–24, irrigated; Upland Stony Loam range site.

Manderfield cobbly loam, 1 to 6 percent slopes (MeC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 25 to 40 percent cobbles. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is used for range, wildlife habitat, watershed catchment, and irrigated crops. The crops are alfalfa hay, small grain, and pasture. Capability unit VIs–U, nonirrigated, and IVs–24, irrigated; Upland Stony Loam range site.

Manderfield cobbly loam, 1 to 6 percent slopes, eroded (MFC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is about 2 inches thick and is 25 to 40 percent cobbles. Included in mapping is one small area east of Beaver that has slopes of 15 to 30 percent.

This soil is moderately eroded. It has slightly less available water capacity than Manderfield loam, 1 to 3 percent slopes. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, wildlife habitat, watershed catchment, and woodland. Nearly closed stands of juniper and pinyon and only a little understory vegetation grow in parts of this mapping unit. Range management practices, such as clearing, seeding, and proper use improve the vegetation cover, increase forage production, and control erosion. The cobbly surface is a slight limitation for range seeding. Capability unit VIs–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Maple Mountain Series

The Maple Mountain series consists of deep, moderately steep to very steep, well-drained soils on mountains. These soils formed in alluvium and colluvium derived from acid and intermediate igneous material. Maple Mountain soils are in the Maple Mountain area and in the Mineral Mountains near Cunningham Ranch. They are associated with Yardley and Wallsburg soils. Elevation ranges from 7,100 to 7,700 feet. Mean annual air temperature is 39° to 40° F, average annual precipitation is 18 to 20 inches, and the frost-free period is 65 to 85 days. The vegetation is Gambel oak, big sagebrush, bitterbrush, bluebunch wheatgrass, and slender wheatgrass.

In a representative profile the surface layer is dark grayish-brown cobbly loam about 10 inches thick. The subsoil is grayish-brown, brown, and light-brown, firm cobbly clay loam about 40 inches thick. The underlying layer is pale-brown, friable sandy clay loam.

Maple Mountain soils are slightly eroded. The available water capacity is 9 to 10 inches in a 5-foot profile and the water-supplying capacity is 12 to 15 inches. Permeability is moderately slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, watershed catchment, and wildlife habitat. They are suitable for clearing and range seeding where they have suitable slopes and such practices are needed.

Representative profile of Maple Mountain cobbly loam, 25 to 50 percent slopes, 10 miles north and 4 miles west of Manderfield; ½ mile south of the northwest corner of sec. 1, T. 27 S., R. 8 W.

A1—0 to 10 inches, dark grayish-brown (10YR 4/2) cobbly loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; soft, friable, slightly sticky and slightly plastic; common fine and medium and few coarse roots; few, fine tubular pores; slightly acid (pH 6.1); clear, smooth boundary.

B21t—10 to 14 inches, grayish-brown (10YR 5/2) cobbly clay loam, dark brown (10YR 3/3) when moist; moderate, medium, blocky structure that parts to moderate, fine, subangular blocky; hard, firm, sticky and plastic; common fine and medium and few coarse roots; few, fine, tubular pores; moderate, continuous clay films; slightly acid (pH 6.5); clear, smooth boundary.

B22t—14 to 33 inches, brown (7.5YR 5/4) cobbly clay loam, dark brown (7.5YR 4/4) when moist; moderate, coarse, subangular blocky structure that parts to moderate, fine, subangular blocky; very hard, very firm, sticky and very plastic; common fine and few medium and coarse roots; few, fine, tubular pores; thick, continuous clay films; slightly acid (pH 6.3); gradual, smooth boundary.

B23t—33 to 50 inches, light-brown (7.5YR 6.5) cobbly clay loam, brown (7.5YR 4/4) when moist; moderate, medium, subangular blocky structure that parts to moderate, fine, subangular blocky; hard, firm, sticky and plastic; few fine roots; few, fine, tubular pores; moderate, continuous clay films; slightly acid (pH 6.4); gradual, smooth boundary.

C—50 to 60 inches, pale-brown (10YR 6/3) sandy clay loam, brown to dark brown (10YR 4/3) when moist; massive; hard, friable, slightly sticky and plastic; few medium roots; few, fine and medium, tubular pores; slightly calcareous; mildly alkaline (pH 7.8).

The A1 horizon is 8 to 12 inches thick. It has color hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3

when moist, and chroma of 2 or 3. The B2t horizon is 32 to 40 inches thick. It has color hue of 5YR to 10YR but 7.5YR is dominant. In the upper 20 inches of this horizon value is 5 when dry and 3 when moist and chroma of 2 or 3, but below a depth of 20 inches, the value is 5 or 6 when dry and 4 or 5 when moist and chroma is 2 to 4. The B2t horizon is cobbly light clay loam or cobbly clay loam. The C horizon is sandy clay loam that may be cobbly in places.

Maple Mountain cobbly loam, 25 to 50 percent slopes (MGG).—This steep to very steep soil is on mountains. It has the profile described as representative of the series. Runoff is rapid, and the hazard of erosion is high.

Most of the area is not suitable for range seeding because it is very steep. Aerial spraying may be beneficial where there is an adequate understory of grass but little or no Gambel oak. Capability unit VIIe–M, nonirrigated; Mountain Loam range site.

May Day Series

The May Day series consists of shallow, moderately sloping to steep, well-drained soils that are underlain by an indurated, lime-cemented hardpan. These soils are on mountains. They formed in colluvium and alluvium derived from intermediate igneous and sedimentary material. May Day soils are in the general area of Birch Creek southeast of Beaver and on east and west slopes in the central part of the Mineral Mountain Range. Elevation ranges from 6,400 to 7,000 feet. Mean annual air temperature is 40° to 44°, average annual precipitation ranges from 13 to 16 inches, and the frost-free period is 80 to 100 days. The vegetation is juniper-pinyon, bitterbrush, cliffrose, snakeweed, big sagebrush, bluebunch wheatgrass, cheatgrass, Indian ricegrass, squirreltail, muttongrass, and blue grama.

May Day soils are associated with Deer Creek soils and McQuarrie soils, coarse-textured subsoil variant.

In a representative profile the surface layer is dark grayish-brown very cobbly loam about 5 inches thick. The subsoil is dark grayish-brown and brown firm very cobbly sandy clay loam that extends to a depth of about 17 inches. It is underlain by an indurated, lime-cemented hardpan.

May Day soils are moderately eroded. The available water capacity above the hardpan is 1.5 to 2 inches, and the water-supplying capacity is about 5 to 6 inches. Permeability above the hardpan is moderately slow. The root zone is restricted by the hardpan.

These soils are used for range, wildlife habitat, watershed catchment, and woodland. They are not suitable for clearing and range seeding because they are shallow and have a cobbly surface layer.

Representative profile of May Day very cobbly loam, 3 to 10 percent slopes, in an area of May Day-Deer Creek association, 3 to 20 percent slopes, where the old Birch Creek Road leaves the pole line road, 7 miles southeast of Beaver, SW½ sec. 9, T. 30 S., R. 6 W.

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) very cobbly loam, very dark brown (10YR 2/2) when moist; weak, medium subangular, blocky structure that parts to weak, medium, granular; soft, friable, slightly sticky and plastic; common fine roots and few medium roots; common fine pores and few, medium, tubular pores; moderately alkaline (pH 8.0); clear, smooth boundary.

B21t—5 to 12 inches, dark grayish-brown (10YR 4/2) cobbly sandy clay loam, very dark grayish brown (10YR 3/2) when moist; moderate, medium, subangular blocky structure that parts to moderate, fine, subangular blocky; hard, firm, sticky and plastic; common fine and medium roots and few coarse roots; common, fine and medium pores and few, coarse, tubular pores; thin, patchy clay films; moderately alkaline (pH 8.4); clear, wavy boundary.

B22tca—12 to 17 inches, brown (10YR 4/3) very cobbly sandy clay loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure that parts to weak, fine, granular; hard, firm, sticky and plastic; few, fine, medium, and coarse roots; common fine, few medium, and few coarse tubular pores; thin, patchy clay films; moderately calcareous; moderately alkaline (pH 8.4); abrupt, irregular boundary.

Ccam—17 inches, indurated, lime-cemented hardpan.

The A1 horizon is 3 to 8 inches thick. It has color hue of 10YR or 7.5YR, color value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. The B2t horizon is 10 to 15 inches thick and is cobbly light clay loam, cobbly clay loam, or cobbly sandy clay loam. It has color hue of 10YR or 7.5YR, color value of 4 or 5 when dry and 3 when moist, and chroma of 2 or 3. The combined A and B horizons are 15 to 20 inches thick over the indurated, lime-cemented hardpan.

May Day association, 10 to 60 percent slopes (MHG).—This mapping unit consists of 50 percent May Day very cobbly loam, 10 to 30 percent slopes, 35 percent McQuarrie very cobbly loam, coarse-textured subsoil variant, 30 to 60 percent slopes, and 15 percent Rock outcrop.

The May Day soil is moderately steep to steep; the McQuarrie soil is steep and very steep. The McQuarrie soil has the profile described as representative of the McQuarrie variant.

Runoff is rapid, and the hazard of erosion is high.

These soils are used for range, wildlife habitat, watershed catchment, and woodland. They are not suitable for clearing and seeding because they have a very cobbly surface layer, are shallow, and are very steep. May Day soil—capability unit VIIs–U, nonirrigated, Upland Shallow Hardpan (Juniper-Pinyon) range site; McQuarrie variant—capability unit VIIs–U, nonirrigated, Upland Stony Hills (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

May Day-Deer Creek association, 3 to 20 percent slopes (MIE).—This mapping unit consists of 60 percent May Day very cobbly loam, 3 to 10 percent slopes, and 40 percent Deer Creek very cobbly loam, 3 to 20 percent slopes, eroded.

The May Day soil occurs on fans, terraces, and ridgetops. Slopes range from 3 to 10 percent, but are generally 3 to 6 percent. The Deer Creek soil is on mountains. The May Day soil has the profile described as representative of the May Day series. The Deer Creek soil has a profile similar to the one described as representative of the Deer Creek series, but its surface layer is very cobbly and has more than 50 percent coarse fragments.

Runoff is medium, and the hazard of erosion is moderate.

These soils are used for range, wildlife habitat, and watershed catchment. They are not suitable for clearing and range seeding because they have a very cobbly surface layer and because the May Day soil is shallow. In places where the grass understory is adequate, management of brush and trees is beneficial. Capability unit VIIs–U, nonirrigated; May Day soil—Upland Shallow Hardpan (Juniper-Pinyon) range site, Deer Creek soil—Upland Loam range site.

McQuarrie Series

The McQuarrie series consists of shallow, gently sloping to steep, well-drained soils on ridges and hills. These soils formed in residuum weathered from basic igneous material. McQuarrie soils are in the north end of the survey area, 8 miles east and 3.5 miles north of Antelope Spring. They are commonly associated with Rock outcrop. Elevation ranges from 5,400 to 5,800 feet. Mean annual air temperature is 46° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 110 days. The vegetation is big sagebrush, juniper, and bluebunch wheatgrass.

In a representative profile the surface layer is brown very cobbly loam about 6 inches thick. The subsoil is brown, firm clay loam and pale-brown, firm very cobbly clay loam underlain at a depth of about 19 inches by basalt.

McQuarrie soils are slightly eroded. The available water capacity is 2 to 3 inches above the bedrock, and the water supplying capacity is 5 to 8 inches. Permeability is moderate. Roots are restricted by the bedrock.

These soils are used for range, wildlife habitat, and watershed catchment. They are not suitable for clearing and range seeding because they have a very cobbly surface and are shallow. Vegetation can be improved by using good range management.

Representative profile of McQuarrie very cobbly loam, in an area of McQuarrie rocky loam, 2 to 30 percent slopes, 8 miles east and 3½ miles north of Antelope Spring, ¼ mile southeast of the northwest corner of sec. 22, T. 24, S., R. 8 W.

A11—0 to 2 inches, brown (10YR 5.4/3) very cobbly loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and plastic; few fine and medium roots; common, fine, tubular pores; moderately alkaline (pH 8.0); abrupt, smooth boundary.

A12—2 to 6 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and plastic; few fine and medium roots; common, fine, tubular pores; moderately alkaline (pH 8.0); clear, smooth boundary.

B2t—6 to 14 inches, brown (7.5YR 5/4) clay loam, brown to dark brown (7.5YR 4/3) when moist; moderate, medium, subangular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; few fine and medium pores; thin, continuous clay films; mildly alkaline (pH 7.6); gradual, wavy boundary.

B3—14 to 19 inches, pale-brown (10YR 6/3) very cobbly clay loam, brown (10YR 5/3) when moist; weak, fine, subangular blocky structure; hard, firm, sticky and plastic; few fine roots; few fine pores; slightly calcareous; moderately alkaline (pH 8.4); gradual, wavy boundary.

R—19 inches, fractured basalt.

The A horizon is 3 to 8 inches thick. It has color value of 4 or 5 when dry and 3 when moist, and chroma of 2 or 3. The B2t horizon is clay loam to heavy clay loam. It has color hue of 7.5YR and 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 or 4. Color values darker than 3.5 when moist and 5.5 when dry are between 6 and 8 inches below the surface. The B3 horizon is clay loam that has 30 to 70 percent coarse fragments. Basalt is at a depth of 12 to 20 inches.

McQuarrie rocky loam, 2 to 30 percent (MKF).—This mapping unit is 95 percent McQuarrie very cobbly loam, 2 to 30 percent slopes, and 5 percent Rock outcrop. The Rock outcrop occurs more commonly on the ridgetops. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Included in mapping are small areas of Pavant cobbly loam, 1 to 6 percent slopes. McQuarrie soil—capability unit VIIs–U, nonirrigated, Upland Stony Hills (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

McQuarrie Variant

The McQuarrie variant consists of shallow, moderately sloping to very steep, well-drained soils on mountains. These soils formed in residuum and colluvium derived from limestone and intermediate igneous material. They are in the Mineral Mountains south of Beaver Airport. They are associated with Red Butte, Pass Canyon, and May Day soils. Elevation ranges from 6,200 to 6,000 feet. Mean annual air temperature is 45° to 47° F, average annual precipitation is 13 to 14 inches, and the frost-free period is 95 to 105 days. The vegetation is bluebunch wheatgrass, blue grama, big sagebrush, yellowbrush, juniper, and pinyon.

In a representative profile the surface layer is brown very cobbly light loam about 8 inches thick. The underlying layer is light brownish-gray, friable very cobbly coarse sandy loam that is underlain at a depth of about 18 inches by fractured limestone.

On soils of the McQuarrie variant, the hazard of erosion is moderate to high. The available water capacity is 1 to 1.5 inches above the bedrock, and the water supplying capacity is about 5 to 8 inches. Permeability is moderately rapid. Roots are restricted by the bedrock.

These soils are used for range, watershed catchment, and wildlife habitat. They are not suitable for clearing and range seeding because they are shallow to bedrock.

Representative profile of McQuarrie very cobbly loam, coarse-textured subsoil variant, 30 to 60 percent slopes, in an area of May Day association, 10 to 60 percent slopes, in the northern part of the Mineral Mountain Range, in the center of sec. 2, T. 27 S., R. 9 W.

A1—0 to 8 inches, brown (10YR 5/3) very cobbly light loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; soft, friable, nonsticky and nonplastic; common fine and medium and few coarse roots; few, fine, tubular pores; slightly calcareous; moderately alkaline (pH 8.2); gradual, wavy boundary.

C—8 to 18 inches, light brownish-gray (10YR 6/2) very cobbly coarse sandy loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular

structure; soft, friable, nonsticky and nonplastic; common fine and medium and few coarse roots; few, fine, tubular pores; moderately calcareous; moderately alkaline (pH 8.4).
R—18 inches, fractured limestone.

The A1 horizon is 6 to 9 inches thick. It has color hue of 10YR or 7.5YR, value of 5 when dry and 3 when moist, and chroma of 2 or 3. It is 50 to 80 percent, by volume, coarse fragments. The C horizon is 60 to 95 percent coarse fragments, which increase with increasing depth. It has color hue of 10YR to 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 2 or 3. This horizon ranges from very cobbly coarse sandy loam to very cobbly loam. Depth to bedrock is 10 to 18 inches.

McQuarrie very cobbly loam, coarse textured subsoil variant, 5 to 30 percent slopes (MLF).—On this soil, runoff is medium to rapid and the hazard of erosion is moderate to high. Included in mapping are small areas of Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, eroded, and Rock outcrop. This soil is used for range, watershed catchment, and wildlife habitat. Capability unit VIIs–U, nonirrigated; Upland Stony Hills (Juniper-Pinyon) range site.

Mill Hollow Series

The Mill Hollow series consists of deep, gently sloping to steep, well-drained soils on mountains and hills. These soils formed in alluvium derived from basic igneous material. Mill Hollow soils are mainly in the northern end of the survey area. They are associated with Firmage, Pharo, and Ushar soils and Rock outcrop. Elevation ranges from 5,900 to 6,500 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is big sagebrush, Indian ricegrass, bluebunch wheatgrass, and scattered juniper.

In a representative profile the surface layer is brown very cobbly loam and loam about 7 inches thick. The upper part of the underlying layer is brown, pale-brown, or white, friable, very strongly calcareous loam about 27 inches thick. The lower part of the underlying layer is white stony loam.

On Mill Hollow soils, the hazard of erosion is moderate to high. The available water capacity is 7 to 9 inches in a 5-foot profile, and the water supplying capacity is 7 to 10 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, watershed catchment, and wildlife habitat. They are suitable for brush management, clearing, and range seeding where such practices are necessary. The cobbly surface restricts the use of drills for range seeding. Vegetation can be improved by using good range management.

Representative profile of Mill Hollow very cobbly loam, 2 to 10 percent slopes, 4 miles north and 6 miles east of Antelope Point, SE¼ of sec. 26, T. 24 S., R. 8 W.

A11—0 to 2 inches, brown (10YR 5/3) very cobbly loam, dark brown (10YR 3/3) when moist; weak, thin, platy structure that parts to weak, fine, granular; soft, friable, slightly sticky and plastic; common fine and medium and few coarse roots; vesicular pores; moderately alkaline (pH 8.2); abrupt, smooth boundary.

A12—2 to 7 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; soft, friable, slightly sticky and plastic; common fine and medium and few coarse roots; few, fine and medium, tubular pores; slightly calcareous; moderately alkaline (pH 8.2); clear, smooth boundary.

C1ca—7 to 10 inches, brown (10YR 5/3) loam, dark brown to brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common fine and few medium roots; few, medium and coarse, tubular pores; strongly calcareous; strongly alkaline (pH 8.5); gradual, smooth boundary.

C2ca—10 to 14 inches, pale-brown (10YR 6/3) loam, brown (10YR 5/3) when moist; weak, fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few, fine and medium, tubular pores; strongly calcareous; strongly alkaline (pH 8.6); gradual, smooth boundary.

C3ca—14 to 34 inches, white (10YR 8/2) loam, very pale brown (10YR 7/3) when moist; massive; weakly cemented, friable, slightly sticky and slightly plastic; few fine roots; few, fine, tubular pores; very strongly calcareous; strongly alkaline (pH 8.8).

C4ca—34 to 60 inches, white (10YR 8/2) extremely stony loam, very pale brown (10YR 7/3) when moist; massive; weakly cemented, friable, slightly sticky and slightly plastic; few fine roots; few, fine, tubular pores; very strongly calcareous; strongly alkaline (pH 8.8).

The A1 horizon is 7 to 10 inches thick and is 10 to 80 percent cobbles. It has color hue of 10YR or 7.5YR, value of 5 when dry and 3 when moist, and chroma of 2 or 3. The C horizon is heavy loam or heavy silt loam. Depth to the horizon of lime accumulation ranges from 7 to 10 inches. Variable amounts of cobbles and stones occur in the lower part of the C horizon below a depth of 30 inches.

Mill Hollow very cobbly loam, 2 to 10 percent slopes (MMD).—This gently rolling to rolling soil occurs on hills. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate.

This soil is not suitable for range seeding with drills because it has a very cobbly surface. Capability unit VIIs–U, nonirrigated; Upland Limy Loam range site.

Mill Hollow-Pharo association, 2 to 30 percent slopes (MNF).—This mapping unit is about 50 percent Mill Hollow very cobbly loam, 2 to 10 percent slopes; 30 percent Pharo very cobbly loam, 3 to 30 percent slopes; 5 percent Rock outcrop; 5 percent Ushar cobbly loam, 3 to 30 percent slopes, eroded; 5 percent Mosida loam, 1 to 3 percent slopes, and 5 percent Pharo cobbly loam, 3 to 30 percent slopes, eroded. These gently sloping to steep soils are on rolling hills and mountainsides. The Pharo soil commonly occurs on the ridges, but there is no definite pattern of occurrence. Included in mapping are very small areas of Manderfield cobbly loam, 1 to 6 percent slopes, eroded.

Runoff is medium to rapid, and the hazard of erosion is moderate.

These soils are not suitable for range seeding with drills because they have a very cobbly surface. Vegetation can be improved by proper range use and other good management. Capability unit VIIs–U, nonirrigated; Mill Hollow soil—Upland Limy Loam range site; Pharo soil—Upland Stony Loam (Juniper-Pinyon) range site.

Mill Hollow-Ushar association, 3 to 30 percent slopes (MOF).—This mapping unit is about 50 percent Mill Hollow cobbly loam, 5 to 30 percent slopes; 30 percent Ushar cobbly loam, 3 to 30 percent slopes, eroded; 15 percent Firmage very cobbly loam, 5 to 30 percent slopes; and 5 percent Rock outcrop. These gently sloping to steep soils are on rolling hills and mountainsides. There is no regular pattern of occurence.

The Mill Hollow soil has a profile similar to the one described as representative of the series, but the surface layer has cobbles. The Ushar soil has a profile similar to the one described as representative of the Ushar series, but the cobbly surface layer is 20 to 40 percent coarse fragments and the dark-colored surface layer is about 2 inches thinner. Mill Hollow soil—capability unit VIe–U, nonirrigated; Upland Limy Loam range site; Ushar soil—capability unit VIe–U, nonirrigated, Upland Loam (Juniper-Pinyon) range site; and Firmage soil—capability unit VIIs–U, nonirrigated, Upland Limy Loam (Juniper-Pinyon) range site.

Mineral Mountain Series

The Mineral Mountain series consists of deep, very steep, well-drained soils on mountains. These soils formed in colluvium and alluvium derived from gneiss intermediate igneous material. Mineral Mountain soils are on the west slopes of the Mineral Mountain Range. They are associated with Snake Hollow soils. Elevation ranges from 6,200 to 7,200 feet. Mean annual air temperature is 40° to 44° F, average annual precipitation is 13 to 16 inches, and the frost-free period is 80 to 100 days. The vegetation is juniper, pinyon, big sagebrush, bluebunch wheatgrass, and cheatgrass.

In a representative profile the surface layer is brown very cobbly loam and loam about 8 inches thick. The subsoil is light-brown or brown, friable cobbly heavy clay loam or light clay about 26 inches thick. The underlying layer is strongly calcareous pinkish-white loam or cobbly loam.

Mineral Mountain soils are slightly to moderately eroded. The available water capacity is 6 to 7 inches in a 5-foot profile and the water supplying capacity is 9 to 11 inches. Permeability is slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, and watershed catchment. They are not suitable for clearing and range seeding because they are steep and have a very cobbly surface layer. The juniper and pinyon occur in open stands.

Representative profile of Mineral Mountain very cobbly loam, 30 to 60 percent slopes, eroded, in an area of Mineral Mountain-Snake Hollow association, 3 to 60 percent slopes, eroded, on the west side of the Mineral Mountain Range ½ mile northwest of Kirk Canyon Junction; 2,000 feet north, 1,340 feet east of the southwest corner of sec. 27, T. 27 S., R. 9 W.

A11—0 to 3 inches, brown (10YR 5/3) very cobbly loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, platy structure that parts to weak, fine, granular; friable, slightly sticky and slightly plastic; common fine and medium roots; common, fine, tubular pores; slightly acid (pH 6.4); clear, smooth boundary.

A12—3 to 8 inches, brown to dark-brown (10YR 4/3) loam, dark brown (10YR 3/3) when moist; moderate, fine, granular structure; friable, slightly sticky and slightly plastic; common fine and medium roots; common, fine, tubular pores; slightly acid (pH 6.4); gradual, smooth boundary.

B21t—8 to 22 inches, light-brown (7.5YR 6/4) cobbly heavy clay loam, brown to dark brown (7.5YR 4/3) when moist; moderate, coarse, subangular blocky structure that parts to moderate, fine, subangular blocky; firm, sticky and plastic; common medium roots; few, medium and common, fine tubular pores; thin, continuous clay films on ped faces; neutral (pH 6.6); gradual, smooth boundary.

B22t—22 to 34 inches, brown (7.5YR 5/4) light clay, brown to dark brown (7.5YR 4/3) when moist; moderate, medium, subangular blocky structure; very firm, very sticky and very plastic; common medium roots; thick, continuous clay films on ped faces; mildly alkaline (pH 7.4); gradual, smooth boundary.

Cca—34 to 60 inches, pinkish-white (7.5YR 8/2) light loam, light brown (7.5YR 6/3) when moist; massive; very friable, slightly sticky and slightly plastic; few fine and medium roots; few, fine, tubular pores; strongly calcareous; strongly alkaline (pH 8.8).

The A1 horizon is 7 to 10 inches thick. It has color hue of 10YR or 7.5YR, value of 5 when dry and 3 when moist, and chroma of 2 or 3. The B2t horizon ranges from 20 to 36 inches in thickness and from cobbly clay loam to light clay. It has color hue of 10YR or 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 3 or 4. The combined A and B horizons are 24 to 48 inches thick over accumulations of lime that are 12 to 30 inches or more thick. In places the C horizon is cobbly.

Mineral Mountain extremely rocky loam, 30 to 60 percent slopes (MPG).—This mapping unit is 60 percent Mineral Mountain very cobbly loam, 30 to 60 percent slopes, eroded, and 40 percent Rock outcrop. The Mineral Mountain soil has a profile similar to the one described as representative of the series, but it is extremely rocky. Runoff is rapid, and the hazard of erosion is high. Mineral Mountain soil—capability unit VIIs–U, nonirrigated, Upland Stony Loam (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Mineral Mountain-Snake Hollow association, 3 to 60 percent slopes, eroded (MRG2).—This mapping unit is about 40 percent Mineral Mountain very cobbly loam, 30 to 60 percent slopes, eroded; 20 percent Snake Hollow coarse sandy loam, 3 to 10 percent slopes, eroded; and 40 percent Rock outcrop. The Mineral Mountain soil is on very steep side slopes, and the Snake Hollow soil is in narrow alluvial valleys.

These soils have the profile described as representative of the Mineral Mountain and Snake Hollow series. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Included in mapping are small areas of Mineral Mountain very cobbly loam that has slopes of 10 to 30 percent.

The Snake Hollow soil is suitable for clearing and range seeding, but the Mineral Mountain soil is not because it has a very cobbly surface layer and is steep. Mineral Mountain soil—capability unit VIIs–U, nonirrigated, Upland Stony Loam (Juniper-Pinyon) range site; Snake Hollow soil—capability unit VIe–U, nonirrigated, Upland Stony Loam (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Mineral Mountain Gravelly Subsoil Variant

The Mineral Mountain gravelly subsoil variant, consists of deep, gently sloping to very steep, well-drained soils on ridgetops and mountains. These soils formed in alluvium derived from intermediate igneous material. Mineral Mountain gravelly subsoil variant soils are in the mountain range about 4 miles north and 3 miles west of Manderfield. Elevation ranges from 6,600 to 7,300 feet. Mean annual air temperature is 40° to 44° F, average annual precipitation is 15 to 18 inches, and the frost-free period is 80 to 100 days. The vegetation includes big sagebrush, Gambel oak, juniper, slender wheatgrass, and squirreltail.

In a representative profile the surface layer is dark grayish-brown very cobbly loam about 6 inches thick. The upper 31 inches of the subsoil is reddish-brown, firm, very cobbly loam and very cobbly heavy clay loam. The lower part is light-brown very cobbly heavy loam and some weathering rocks.

These soils are moderately eroded, but water erosion is more noticeable on ridgetops and in drainageways. Permeability is moderate to slow. Roots can penetrate to a depth of more than 5 feet. The available water capacity is 5 to 6 inches in a 5-foot profile, and the water supplying capacity is about 9 to 13 inches.

These soils are not suitable for clearing and range seeding because they have a very cobbly surface layer and are steep. Vegetation can be improved by good range management.

Representative profile of Mineral Mountain very cobbly loam, gravelly subsoil variant, 2 to 20 percent slopes, 4¼ miles north and 3 miles west of Manderfield, ¼ mile southwest of the northeast corner of sec. 36, T. 27 S., R. 8 W.

A1—0 to 6 inches, dark grayish-brown (10YR 4/2) very cobbly loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; interstitial pores; mildly alkaline (pH 7.4); abrupt, smooth boundary.

B21—6 to 12 inches, reddish-brown (5YR 5/4) very cobbly loam, dark brown (7.5YR 3/4) when moist; moderate, medium, angular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; interstitial pores; moderate, continuous clay films; mildly alkaline (pH 7.4); clear, smooth boundary.

B22t—12 to 37 inches, reddish-brown (5YR 5/4) very cobbly heavy clay loam, reddish brown (5YR 4/4) when moist; moderate, medium, angular blocky structure that parts to weak, fine, angular blocky; hard, firm, sticky and plastic; common fine and medium roots; interstitial pores; moderate, continuous clay films; mildly alkaline (pH 7.4); gradual, wavy boundary.

B3t—37 to 60 inches, light-brown (7.5YR 5.6/4) very cobbly heavy loam and some weathering rocks, brown (7.5YR 5/4) when moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; thin, scattered clay films; mildly alkaline (pH 7.6).

The A1 horizon is 4 to 10 inches thick. It has color of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. The B2t horizon is very cobbly loam to very cobbly clay loam. It has color hue of 7.5YR or 5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4. The B3t horizon has color value of 3 to 5 when moist. Content of cobbles is 50 to 70 percent, by volume. The combined A and B horizons are more than 40 inches thick.

Mineral Mountain very cobbly loam, gravelly subsoil variant, 2 to 20 percent slopes (MSE).—This soil occurs on ridges and mountainsides. It has the profile described as representative of this Mineral Mountain gravelly subsoil variant. Runoff is medium, and the hazard of erosion is moderate.

This soil is suitable for range, wildlife habitat, and watershed catchment. It is not suitable for clearing and seeding because it has a very cobbly surface layer. Capability unit VIIs–M, nonirrigated; Mountain Stony Loam range site.

Mineral Mountain very cobbly loam, gravelly subsoil variant, 40 to 60 percent slopes, eroded (MSG2).—This soil is along narrow drainageways. It has a profile similar to the one described as representative of the variant but the surface layer is only 4 inches thick in some places. Shallow gullies are common. Runoff is rapid, and the hazard of erosion is high. Included in mapping are areas of cobbly alluvial material, which are in the bottom of drainageways, and a few areas of Rock outcrop.

This soil is used for range, watershed catchment, and wildlife habitat. It is not suitable for range seeding because it has a very cobbly surface layer and is very steep. Capability unit VIIs–M, nonirrigated; Mountain Stony Loam range site.

Mineral Mountain Noncalcareous Variant

The Mineral Mountain noncalcareous variant consists of deep, gently sloping to steep, well-drained soils on rolling mountains. These soils formed in colluvium and alluvium derived from granitic and intermediate igneous material. They are on rolling mountains of the Mineral Range in the area of Cunningham Ranch. They are mapped only in the Cowers association, 2 to 30 percent slopes, eroded. Elevation ranges from 7,000 to 7,600 feet. Mean annual air temperature is 39° to 40° F, average annual precipitation is 16 to 18 inches, and the frost-free period is 65 to 85 days. The vegetation is Gambel oak, snowberry, birchleaf mahogany, lupine, and big sagebrush.

In a representative profile the surface layer is grayish-brown coarse sandy loam 2 inches thick. The subsoil is brown or pale-brown, firm heavy clay loam or light clay 19 inches thick. The underlying layer is pale-brown, very friable sandy loam or coarse sand.

Mineral Mountain noncalcareous variant soils are moderately eroded. The available water capacity is 7 to 8 inches in a 5-foot profile, and the water supplying capacity is 11 to 14 inches. Permeability is moderately slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, and watershed catchment. They are suitable for clearing and seeding to grasses where such practices are needed. Because these soils are erodible, care should be taken in steep areas to control losses of soil.

Representative profile of Mineral Mountain coarse sandy loam, non-calcareous variant, in an area of the Cowers association, 2 to 30 percent slopes, eroded, 8

miles north and 6 miles west of Manderfield, in the NW¼NW¼ sec. 10, T. 27 S., R. W.

A1—0 to 2 inches, grayish-brown (10YR 5/2) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; slightly hard, friable, nonsticky and nonplastic; few fine roots; few, fine, tubular pores; neutral (pH 6.8); abrupt, smooth boundary.

B21t—2 to 13 inches, brown (10YR 5/3) gravelly heavy clay loam, brown to dark brown (10YR 4/3) when moist; moderate, medium, subangular blocky structure; very hard, firm, sticky and plastic; common medium and fine and few coarse roots; few, fine, tubular pores; moderate, continuous clay films; neutral (pH 6.8); gradual, wavy boundary.

B22t—13 to 21 inches, pale-brown (10YR 6/3) heavy clay loam, brown (10YR 5/3) when moist; moderate, medium, angular blocky structure; hard, friable, slightly sticky and plastic; few fine and medium and coarse roots; common, medium and fine, tubular pores; thin, continuous clay films; neutral (pH 6.8); gradual, wavy boundary.

C1—21 to 35 inches, pale-brown (10YR 6/3) coarse sandy loam, brown (10YR 5/3) when moist; massive; hard, very friable, nonsticky and nonplastic; few fine roots; few, fine tubular pores; neutral (pH 6.7); gradual, wavy boundary.

C2—35 to 60 inches, pale-brown (10YR 6/3) coarse sand, brown (10YR 5/3) when moist; single grained; loose, nonsticky and nonplastic; few fine roots; neutral (pH 6.8).

The A1 horizon is 2 to 6 inches thick. It has color hue of 7.5YR or 10YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 2 or 3. The B2t horizon is heavy clay loam or light clay, and in some places is gravelly. It has color value of 4 or 5 in the upper part and 5 or 6 in the lower part when dry and of 4 in the upper part and 5 in the lower part when moist. Chroma is 2 or 3. The combined A and B horizons are 20 to 30 inches thick. The C horizon is sandy loam to coarse sand. In some places fine gravel occurs in the lower part of the C horizon. This soil is mapped only in association with Cowers soils.

Mine Wash

Mine wash (MT). consists of small areas west of the Sulphurdale Mine where waste material from the mine has accumulated. This land has no agricultural value and is so highly acid that vegetation does not grow. Capability unit VIIIs–X.

Mosida Series

The Mosida series consists of deep, gently sloping and moderately sloping, well-drained soils on alluvial fans, in valleys, and on flood plains. These soils formed in alluvium derived from mixed sedimentary and igneous material. Mosida soils are in alluvial valleys in several places throughout the area. They are associated with Ushar soils. Elevation ranges from 5,900 to 6,300 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 13 inches, and the frost-free period is 100 to 108 days. The vegetation is big sagebrush, rabbitbrush, Indian ricegrass, squirreltail, bluebunch wheatgrass, and annual weeds.

In a representative profile the surface layer is dark grayish-brown loam about 6 inches thick. The upper 42 inches of the underlying layer is dark grayish-brown or grayish-brown, very friable loam and silt loam. The lower part is pale-brown, very friable loam.

Mosida soils are slightly to moderately eroded and, in places, gullied. The available water capacity is 7 to 9 inches in a 5-foot profile, and the water supplying capacity is 10 to 12 inches. Permeability is moderate. Roots can penetrate to a depth of 5 feet.

These soils are used for irrigated and nonirrigated crops, wildlife habitat, watershed catchment, and range. They are suitable for brush management, clearing, and range seeding where such practices are needed.

Representative profile of Mosida loam, 1 to 3 percent slopes, 2.5 miles south and 1 mile west of the Beaver Post Office, 200 feet northwest of an irrigation well, sec. 32, T. 29 S., R. 7 W.

Ap—0 to 6 inches, dark grayish-brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots; many fine pores; slightly calcareous; neutral (pH 7.0); abrupt, smooth boundary.

C1—6 to 20 inches, dark grayish-brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) when moist; weak, medium, prismatic structure; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; slightly calcareous; mildly alkaline (pH 7.7); abrupt, smooth boundary.

C2—20 to 48 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; few fine pores; slightly calcareous; mildly alkaline (pH 7.8); clear, smooth boundary.

C3—48 to 66 inches, pale-brown (10YR 6/3) loam, dark grayish brown (10YR 4/2) when moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; moderately calcareous; mildly alkaline (pH 7.7).

The A1 horizon is 4 to 8 inches thick. It has color value of 4 or 5 when dry and 3 when moist and chroma of 2. The C horizon, between depths of 10 and 40 inches, is light loam or light silt loam ranging to very fine sandy loam in some places. In places gravelly horizons occur below a depth of 36 inches. These horizons have color value of 4 or 5 when dry and 3 when moist and chroma of 2. The soil is slightly to moderately calcareous and, in places, is noncalcareous.

Mosida loam, 1 to 3 percent slopes (MuB).—This gently sloping soil occurs on alluvial fans, on flood plains, and in valleys. It has the profile described as representative of the series. Runoff is slow, and the hazard of erosion is slight.

This soil is used mainly for irrigated crops. Among these crops are alfalfa, small grain, and occasionally, corn for silage. This soil is suited to locally grown irrigated and nonirrigated crops. Capability unit IIe–26, irrigated, and IVe–UZ, nonirrigated; Upland Loam range site.

Mosida loam, 3 to 6 percent slopes (MuC).—On this soil, runoff is medium and the hazard of erosion is moderate. This soil is used for irrigated and nonirrigated crops. Capability unit IVe–UZ, nonirrigated, and IIIe–26, irrigated; Upland Loam range site.

Mosida loam, 1 to 6 percent slopes, eroded (MuC2).—This soil is gently sloping to sloping and is on alluvial fans and in valleys. It has a profile similar to the one described as representative of the series, but the surface layer is 2 to 3 inches thinner. This soil is moder-

ately eroded, and there are a few gullies. Included in mapping are small areas of Mill Hollow loam, 1 to 10 percent slopes, and Phage loam, 3 to 10 percent slopes, eroded. Runoff is medium, and the hazard of erosion is moderate.

This soil is used mainly for range, but a small acreage is used for nonirrigated crops. It is suited to nonirrigated crops. Capability unit IVe–UZ, nonirrigated; Upland Loam range site.

Mosida loam, 1 to 6 percent slopes, severely eroded (MVC3).—This soil is mainly along Wildcat Creek. Shallow gullies occur every 200 to 400 feet, and there are a few gullies 20 to 30 feet wide and 15 to 25 feet deep. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

This soil is not suited to nonirrigated crops because of the severe gully erosion. Capability unit VIe–U, nonirrigated; Upland Loam range site.

Mosida loam, gravelly substratum, 1 to 6 percent slopes (MwC).—This soil is gently sloping to sloping and is on alluvial fans and in valleys. It has a profile similar to the one described as representative of the series, but it has 30 to 60 percent gravel below a depth of about 36 inches. Runoff is slow to medium, and the hazard of erosion is slight to moderate. The available water capacity is 7 to 8 inches in a 5-foot profile, and the water supplying capacity is 9 to 11 inches.

This soil is used for range and nonirrigated crops. Capability unit IVe–UZ, nonirrigated; Upland Loam range site.

Mud Springs Series

The Mud Springs series consists of moderately deep, very steep, well-drained soils on sides of mountains. These soils formed in residuum weathered from granitic material. Mud Springs soils are in the Mud Springs area on the east side of the Mineral Mountain Range. They are associated with Rock outcrop. Elevation ranges from 7,000 to 7,800 feet. Mean annual air temperature is 41° to 44° F, average annual precipitation is 16 to 20 inches, and the frost-free period is 65 to 100 days. The vegetation is mountainmahogany, juniper, pinyon, Gambel oak, big sagebrush, squirreltail, three-awn, and cheatgrass.

In a representative profile the surface layer is dark grayish-brown and grayish-brown cobbly coarse sandy loam about 10 inches thick. The subsoil is brown and yellowish-brown, friable cobbly and very cobbly sandy loam that is underlain at a depth of 25 inches by granite bedrock.

On Mud Springs soils the hazard of erosion is high. The available water capacity is 2 to 2.5 inches above the bedrock, and the water supplying capacity is 7 to 10 inches. Permeability is moderately rapid. The growth of roots is restricted by bedrock.

These soils are used for range, watershed catchment, wildlife habitat, and woodland. They are not suitable for clearing and range seeding. Vegetation can be improved through good range management.

Representative profile of Mud Springs cobbly coarse sandy loam, in an area of Mud Springs extremely rocky coarse sandy loam, 30 to 40 percent slopes, ¾ mile northwest of Mud Springs in the Mineral Mountain Range, sec. 30 T. 28 S., R. 8 W.

A11—0 to 6 inches, dark grayish-brown (10YR 4/2) cobbly coarse sandy loam, very dark brown (10YR 2/2) when moist; very weak, medium, platy structure that parts to weak, fine, granular; soft, very friable, nonsticky and nonplastic; common fine roots; few, fine and medium, tubular pores; slightly acid (pH 6.3); clear, smooth boundary.

A12—6 to 10 inches, grayish-brown (10YR 5/2) cobbly coarse sandy loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; slightly hard, very friable, nonsticky and nonplastic; common fine and few medium roots; few, fine and medium, tubular pores; slightly acid (pH 6.3); clear, smooth boundary.

B21—10 to 17 inches, brown (10YR 5/3) cobbly sandy loam, dark brown (10YR 3/3) crushed when moist, dark brown (7.5YR 3/3) aggregate when moist; moderate, fine, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few, fine, medium, and coarse roots; few, fine and medium, tubular pores; thin clay coatings on sand grains and as bridgings between particles; slightly acid (pH 6.3); gradual, wavy boundary.

B22—17 to 25 inches, yellowish-brown (10YR 5/4) very cobbly coarse sandy loam, brown and dark brown (10YR 4/3) crushed when moist, brown and dark brown (7.5YR 4/3) aggregate when moist; weak, medium and fine, subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few, fine, medium, and coarse roots; few, fine and medium, tubular pores; thin clay coatings on sand grains and bridgings between particles; slightly acid (pH 6.3); gradual, wavy boundary.

R—25 inches, weathered granite.

The A1 horizon is 4 to 10 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 2 or 3. The B2 horizon is 10 to 24 inches thick and is cobbly or very cobbly sandy loam. It has color hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 through 4. The combined A and B horizons are 24 to 36 inches thick over bedrock.

Mud Springs extremely rocky coarse sandy loam, 30 to 40 percent slopes (MXF).—This mapping unit is 60 percent Mud Springs cobbly coarse sandy loam, 30 to 40 percent slopes, and 40 percent Rock outcrop. Runoff is rapid, and the hazard of erosion is high. Mud Springs soil—capability unit VIIs–M, nonirrigated; Mountain Shallow Loam range site; and Rock outcrop—capability unit VIIIs–X.

Murdock Series

The Murdock series consists of moderately deep, gently sloping and moderately sloping, well-drained soils that have a lime-cemented hardpan. These soils are on dissected terraces, outwash plains, and plateaus. They formed in alluvium derived from intermediate and basic igneous material. Murdock soils are mainly in the southeastern part of the survey area east of Beaver and Manderfield, but one small area is north of Cove Fort. These soils are associated with Flowell and Ushar soils. Elevation ranges from 6,000 to 6,500 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The native vegetation is juniper, pinyon, big sagebrush, Indian ricegrass, bluebunch wheatgrass, and associated annual forbs.

In a representative profile the surface layer is brown or dark grayish-brown silt loam about 9 inches thick. The upper 18 inches of the underlying layer is brown to very pale-brown, firm silt loam. The lower part is a lime-cemented hardpan at a depth of 27 inches.

On Murdock soils, the hazard of erosion is slight to moderate. The available water capacity is 4.5 to 5.5 inches above the bedrock, and the water supplying capacity is 8 to 9 inches. Permeability is moderate above the hardpan. The growth of roots is restricted by the cemented hardpan.

These soils are used for range, wildlife habitat, watershed catchment, and irrigated crops, and they have limited use as woodland. A small acreage is used for nonirrigated crops. These soils are suited to irrigated crops and are suitable for clearing, brush management, and range seeding where such practices are needed.

Representative profile of Murdock silt loam, 1 to 3 percent slopes, 3.5 miles north, 2.8 miles east, and 1.4 miles northeast of the Beaver Post Office on U.S. Highway 91, sec. 27, T. 28 S., R. 7 W

Ap—0 to 4 inches, brown (10YR 5/3) silt loam, dark brown (10YR 3/3) when moist; weak, thick, platy structure that parts to moderate, fine, granular; slightly hard, very friable, slightly sticky and slightly plastic; few fine roots; mildly alkaline (pH 7.5); clear, smooth boundary.

A12—4 to 9 inches, brown to dark grayish-brown (10YR 4/3) silt loam, dark grayish brown (10YR 3.5/3) when moist; weak, thick, platy structure that parts to weak, fine, subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; neutral (pH 7.2); clear, wavy boundary.

C1ca—9 to 15 inches, brown (10YR 5/3) silt loam, dark brown to brown (10YR 4/3) when moist; very weak, subangular blocky structure; hard, friable, sticky and plastic; few fine roots, few fine pores; strongly calcareous; mildly alkaline (pH 7.8); gradual, irregular boundary.

C2ca—15 to 27 inches, very pale brown (10YR 7/3) silt loam, brown (10YR 5/3) when moist; weak, coarse, subangular blocky structure; hard, firm, slightly sticky and plastic; no roots; strongly calcareous; moderately alkaline (pH 8.1); clear, wavy boundary.

C3cam—27 inches, indurated lime hardpan.

The A horizon ranges from 7 to 10 inches in thickness. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 2 or 3. The A and C horizons above the hardpan are light loam to silt loam. They have color value of 5 to 7 when dry and 4 or 5 when moist and chroma of 2 or 3. The horizon of lime accumulation over the lime-cemented hardpan is 10 to 20 inches thick. The hardpan occurs at a depth of 20 to 36 inches.

Murdock silt loam, 1 to 3 percent slopes (MYB).—This gently sloping soil occurs on dissected terraces and fans. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate.

This soil is used mainly as range, but small areas are used for irrigated and nonirrigated crops. The principal limitation is the hardpan. Capability unit IIIe–23, irrigated, and VIe–U, nonirrigated, Upland Shallow Hardpan (Juniper-Pinyon) range site.

Murdock-Flowell association, 1 to 30 percent slopes, eroded (MZF2).—This mapping unit is 60 percent Murdock cobbly silt loam, 1 to 6 percent slopes; 20 percent Flowell cobbly loam, 3 to 6 percent slopes, eroded; and 20 percent Flowell cobbly loam, 6 to 30 percent slopes, eroded. The Murdock soil is less steep and is on terraces and fans. The Flowell soils are on steeper side slopes and rolling ridges.

The Murdock soil has a profile similar to the one described as representative of the series, but it has a cobbly surface layer. Flowell soils have a profile similar to the one described as representative of the Flowell series, but the surface layer is 20 to 40 percent cobbles. Runoff is medium, and the hazard of erosion is moderate. Murdock soil has available water capacity of about 3 to 4 inches above the bedrock.

These soils are suitable for clearing and range seeding where such practices are needed, but they are somewhat limited by the cobbly surface. Capability unit VIe–U, nonirrigated; Murdock soil—Upland Shallow Hardpan (Juniper-Pinyon) range site; Flowell soil—Upland Loam (Juniper-Pinyon) range site.

Oakden Series

The Oakden series consists of very shallow and shallow, moderately sloping to steep, well-drained soils on hills. These soils formed in residuum weathered from limestone. Oakden soils are in the northern part of the survey area. Elevation ranges from 5,700 to 6,200 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, big sagebrush, cheatgrass, snakeweed, and yellowbrush.

In a representative profile the surface layer is light brownish-gray cobbly loam about 4 inches thick. The upper part of the underlying layer is brown, friable loam. The lower part is a thin lime-cemented hardpan that is underlain at a depth of about 11 to 12 inches by limestone bedrock.

On Oakden soils the hazard of erosion is moderate. The available water capacity is 1 to 2 inches above the cemented hardpan, and the water supplying capacity is 5 to 7 inches. Permeability is moderate above the hardpan. Root penetration is restricted by the hardpan.

Representative profile of Oakden cobbly loam, 5 to 30 percent slopes, eroded, in an area of Firmage-Oakden association, 5 to 30 percent slopes, 5 miles north and 5 miles east of Antelope Point, ¾ mile west from the northwest corner of sec. 27, T. 24 S., R. 8 W.

A1—0 to 4 inches, light brownish-gray (10YR 6/2) cobbly loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; few, fine, tubular pores; strongly calcareous; moderately alkaline (pH 8.4); clear, smooth boundary.

C1ca—4 to 7 inches, brown (10YR 5/3) loam, brown to dark brown (10YR 4/3) when moist; weak, fine, subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common fine and medium roots; few, fine, tubular pores; strongly calcareous; moderately alkaline (pH 8.0); abrupt, smooth boundary.

C2cam—7 to 11 inches, white (10YR 8/1) lime hardpan, indurated and laminar, strongly alkaline (pH 9.0); gradual, wavy boundary.

R—11 inches, limestone.

The A1 horizon ranges from 3 to 5 inches in thickness. It has color value of 6 when dry and 3 or 4 when moist and chroma of 3. The C horizon is loam or heavy sandy loam. It has color value of 5 or 6 when dry and 4 or 5 when moist and chroma of 3. The Ccam layer is strongly cemented to indurated and 6 to 12 inches thick. Depth to bedrock ranges from 10 to 16 inches.

This soil is mapped only in association with Firmage soils.

Oasis Series

The Oasis series consists of deep, gently sloping, well-drained soils that are affected by alkali. These soils are on flood plains and alluvial fans. They formed in alluvium derived from igneous and sedimentary materials. Oasis soils are mainly on the fans above the Beaver River in the area near Greenville. Elevation ranges from 5,300 to 5,900 feet. Mean annual air temperature is 48° to 49° F, average annual precipitation is 10 to 12 inches, and the frost-free period is 105 to 115 days. The vegetation is greasewood, Russian-thistle, and cheatgrass.

In a representative profile the surface layer is pale-brown, friable light loam about 8 inches thick. The upper 24 inches of the underlying layer is pale-brown and light-brown, friable light loam. The lower part is light-brown, friable sandy loam. All horizons are strongly alkaline or very strongly alkaline.

The hazard of erosion is moderate. The available water capacity is 6.5 to 8.5 inches, and the water supplying capacity is only about 4 to 5 inches because of the high content of salts and alkali. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range and wildlife habitat. They are not suitable for clearing and range seeding because they contain salts and because precipitation is low. They are suitable for irrigation where the saline and alkali salts have been leached out.

Representative profile of Oasis loam, 1 to 3 percent slopes, 7.1 miles west of Beaver Post Office on U.S. Highway 21, 100 feet south of highway, SW¼ of sec. 28, T. 29 S., R. 8 W.

Ap1—0 to 2 inches, pale-brown (10YR 6/3) light loam, brown to dark brown (10YR 4/3) when moist; weak, thick, platy structure that parts to weak, coarse, granular; very hard, friable, slightly sticky and slightly plastic; common fine roots; few fine pores; moderately calcareous; very strongly alkaline (pH 9.1); abrupt, smooth boundary.

Ap2—2 to 8 inches, pale-brown (10YR 6/3) light loam, brown to dark brown (10YR 4/3) when moist; weak, coarse, subangular blocky structure that parts to fine, blocky; very hard, friable, slightly sticky and slightly plastic; few medium roots; few fine pores; moderately calcareous; very strongly alkaline (pH 9.9); abrupt, smooth boundary.

C1—8 to 16 inches, pale-brown (10YR 6/3) light loam, brown to dark brown (10YR 4/3) when moist; weak, medium, prismatic structure that parts to moderate, medium, subangular blocky; hard, friable, slightly sticky and slightly plastic; few medium roots; few fine pores; moderately calcareous; somewhat dense and weakly cemented; very strongly alkaline (pH 9.6); clear, wavy boundary.

C2—16 to 32 inches, light-brown (7.5YR 6/3) light loam, brown to dark brown (7.5YR 4/4) when moist; weak, coarse, subangular blocky structure that parts to fine, blocky; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; moderately calcareous, and content of lime increases with increasing depth; weakly cemented in the lower part; strongly alkaline (pH 8.5); clear, wavy boundary.

C3—32 to 60 inches, light-brown (7.5YR 6/3) sandy loam; brown (7.5YR 4.5/4) when moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; no pores; strongly calcareous; moderately alkaline (pH 8.3).

The A1 horizon is 5 to 8 inches thick and is loam marginal to sandy loam. It has color value of 5 or 6 when dry and 4 when moist and chroma of 2 or 3. The C horizon is light loam or sandy loam. It has color hue of 10YR or 7.5YR, value of 6 when dry and 4 or 5 when moist and chroma of 2 or 3. Gravelly pockets occur in places below a depth of 24 inches. Alkali salts (exchangeable sodium) make up 15 percent to as much as 80 percent of the profile.

Oasis loam, 1 to 3 percent slopes (OAB).—This soil has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate. This soil is moderately affected by saline salts as well as moderately to strongly affected by alkali salts. Capability unit VIIs–S8, nonirrigated; Semidesert Alkali Flats range site.

Paice Series

The Paice series consists of moderately deep, moderately sloping and strongly sloping, well-drained soils that have an indurated lime-cemented hardpan. These soils are on hills. They formed in colluvium and alluvium derived from basic igneous material. The elevation ranges from 6,900 to 7,400 feet. The mean annual air temperature is 40° to 44° F, the average annual precipitation is 16 to 18 inches, and the frost-free period is 80 to 100 days. The vegetation is big sagebrush, Gambel oak, serviceberry, little needlegrass, slender wheatgrass, mountain junegrass, peavine, balsamroot, and lupine.

In a representative profile the surface layer is dark grayish-brown cobbly loam and loam about 9 inches thick. The subsoil is brown, friable clay loam about 15 inches thick. The underlying layer is very pale brown, firm, strongly calcareous loam underlain by an indurated lime-cemented hardpan at a depth of 31 inches.

On Paice soils, the hazard of erosion is moderate. The available water capacity is 5 to 6 inches above the hardpan, and the water supplying capacity is 9 to 12 inches. Permeability is moderate. The growth of roots is restricted by the indurated hardpan.

These soils are used for range, wildlife habitat, and watershed catchment. They are suitable for clearing, brush management, and range seeding where such practices are needed. The cobbly surface soil impedes drill-seeding.

Representative profile of Paice cobbly loam, 3 to 10 percent slopes, 8½ miles north and 5½ miles west of Manderfield, ½ mile west from the northeast corner of sec. 11, T. 27 S., R. 8 W.

A11—0 to 2 inches, dark grayish-brown (10YR 4/2) cobbly loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; soft, friable, nonsticky and slightly plastic; many fine roots; few medium and fine pores; mildly alkaline (pH 7.4); abrupt, smooth boundary.

A12—2 to 9 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; weak, medium, subangular blocky structure that parts to weak, subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common coarse, medium, and fine roots; common medium and few coarse pores; moderately alkaline (pH 8.0); clear, wavy boundary.

B2t—9 to 19 inches, brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; weak, coarse, blocky structure that parts to moderate, fine, angular blocky; very hard, friable, sticky and plastic; common medium and fine roots; few coarse, medium, and fine pores; moderate, continuous clay films; moderately alkaline (pH 8.0); clear, wavy boundary.

B3tca—19 to 24 inches, brown (10YR 5/3) light clay loam, dark brown (10YR 3/3) when moist; weak, medium, subangular blocky structure that parts to moderate, fine, blocky; very hard, friable, sticky and plastic; few medium and fine roots; few fine pores; thin, continuous clay films; moderately calcareous; moderately alkaline (pH 8.2); clear, wavy boundary.

C1ca—24 to 31 inches, very pale brown (10YR 8/3) loam, pale brown (10YR 6/3) when moist; massive; very hard, firm, slightly sticky and slightly plastic; very few fine roots; few fine pores; strongly calcareous; strongly alkaline (pH 8.6).

C2cam—31 to 48 inches, indurated lime hardpan.

The A1 horizon is 5 to 10 inches thick. The B2t horizon is clay loam or light clay loam 10 to 15 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 3. The B3ca horizon is similar to the B2t horizon, but it has chroma of 5 when dry and 3 or 4 when moist. An indurated lime hardpan occurs between depths of 30 and 40 inches. The combined A and B horizons are 20 to 40 inches thick.

Paice cobbly loam, 3 to 10 percent slopes (PAD.)—On this soil, runoff is medium and the hazard of erosion is moderate. Capability unit VIe–M, nonirrigated; Mountain Loam range site.

Pass Canyon Series

The Pass Canyon series consists of shallow and very shallow, moderately sloping to steep, well-drained soils on mountainsides and ridgetops. These soils formed in residuum weathered from intermediate igneous material. Pass Canyon soils are in several places throughout the mountainous areas and foothills of the survey area. They are associated with Red Butte and Deer Creek soils and Rock outcrop. Elevation ranges from 6,000 to 7,000 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 17 inches, and the frost-free period is 95 to 105 days. The vegetation is juniper, bitterbrush, big sagebrush, and bluebunch wheatgrass.

In a representative profile the surface layer is brown very cobbly coarse sandy loam about 3 inches thick. The subsoil is brown, friable or firm cobbly clay loam or cobbly sandy clay loam that is underlain by bedrock at a depth of 14 inches.

These soils are moderately to severely eroded. The available water capacity is 1 to 2 inches, and the water supplying capacity is 4 to 7 inches. Permeability is moderately slow. The bedrock, except in a few fractures, restricts the growth of roots.

These soils are used for range, wildlife, and watershed catchment. They are not suitable for clearing and range seeding because they are shallow. Vegetation can be improved by good range management.

Representative profile of Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, eroded, 2½ miles north and ¾ mile east of Cove Fort, sec. 13, T. 25 S., R. 7 W.

A1—0 to 3 inches, brown (7.5YR 5/2) very cobbly coarse sandy loam, dark brown (7.5YR 3/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and few medium roots; common, fine, and few, medium, tubular pores; mildly alkaline (pH 7.6); abrupt, smooth boundary.

B21t—3 to 9 inches, brown to dark-brown (7.5YR 4/2) heavy sandy clay loam, very dark brown (7.5YR 2/2) when moist; moderate, medium, subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few fine, medium, and coarse roots; few, medium and fine, tubular pores; thin, continuous clay films; mildly alkaline (pH 7.4); clear, smooth boundary.

B22t—9 to 14 inches, brown to dark-brown (7.5YR 4/3) cobbly clay loam, dark brown (7.5YR 3/4) when moist; moderate, medium, subangular blocky structure; hard, firm, slightly sticky and plastic; few fine roots; few, fine, tubular pores; moderate, continuous clay films; mildly alkaline (pH 7.5).

R—14 inches, fractured bedrock.

The A1 horizon is 0 to 6 inches thick. It has color hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. The B2t horizon is cobbly or gravelly clay loam or sandy clay loam, but in some places, it lacks coarse fragments in the upper part. It has color hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. The combined A and B horizons are 5 to 20 inches thick and are underlain by bedrock.

Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, severely eroded (PBF3).—This soil has a profile similar to the one described as representative of the series, but in most areas, all of the surface layer is gone. Depth to bedrock is 5 to 10 inches. This soil can hold 1 inch or less of available water above bedrock. Included in mapping are small areas of Rock outcrop. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Capability unit VIIs–U, nonirrigated; Upland Stony Hills (Juniper-Pinyon) range site.

Pass Canyon very rocky coarse sandy loam, 5 to 30 percent slopes, eroded (PCF2).—This mapping unit is 80 percent Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, eroded, and 20 percent Rock outcrop. The gently sloping to steep Pass Canyon soil is on mountains and ridges, and Rock outcrop occurs on mountains and ridgetops.

The Pass Canyon soil has the profile described as representative of the Pass Canyon series. Runoff is moderate to rapid, and the hazard of erosion is moderate to high. Included in mapping are small areas of Pharo cobbly loam, 3 to 30 percent slopes, eroded, and Ushar cobbly loam, 3 to 30 percent slopes, eroded. Capability unit VIIs–U, nonirrigated, Pass Canyon soil—Upland Stony Hills (Juniper-Pinyon) range site; and Rock outcrop—capability unit VIIIs–X.

Pavant Series

The Pavant series consists of well-drained soils that are shallow over a lime-cemented hardpan. These soils

are gently sloping to moderately sloping on terraces and fans and very steep on mountains. They formed in alluvium derived from intermediate igneous material. Pavant soils are east and south of Beaver in the South Creek area and in the Mineral Mountain Range area near Minersville. They are associated with Rock outcrop. Elevation ranges from 6,100 to 6,900 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, pinyon, big sagebrush, squirreltail, Indian ricegrass, bluebunch wheatgrass, and annual forbs.

In a representataive profile the surface layer is dark grayish-brown and brown, friable cobbly loam and loam about 7 inches thick. The upper part of the underlying layer is light-gray or pinkish-gray, friable, strongly calcareous loam and beneath this at a depth of 18 inches is a lime-cemented hardpan.

On Pavant soils, the hazard of erosion is moderate to high. The available water capacity is 2 to 3 inches above the hardpan, and the water supplying capacity is 5 to 8 inches. Permeability is moderate above the hardpan. The growth of roots is restricted by the cemented hardpan.

These soils are used mainly for range, wildlife habitat, watershed catchment, and woodland, but a small acreage is used for irrigated crops. These soils are not suitable for clearing and range seeding because they have low water capacity, are shallow, and in places are steep. Brush management is beneficial where the understory cover is adequate and the stand of trees is not too dense. Vegetation can be improved by using good range management.

Representative profile of Pavant cobbly loam, 1 to 6 percent slopes, 5 miles east and 4 miles south of Beaver on Birch Creek Road, sec. 8, T. 30 S., R. 6 W.

A11—0 to 2 inches, dark grayish-brown (10YR 4.4/2) cobbly loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; friable, slightly sticky and slightly plastic; common fine and medium roots; few, fine, and medium, random tubular pores; moderately alkaline (pH 7.4); abrupt, smooth boundary.

A12—2 to 7 inches, brown (10YR 4/3) loam; very dark grayish brown (10YR 3/2) when moist; weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; common fine and medium and few coarse roots; few, fine and medium, random tubular pores; slightly calcareous; mildly alkaline (pH 7.6); clear, smooth boundary.

C1ca—7 to 14 inches, pinkish-gray (7.5YR 6/2) loam, brown to dark brown (7.5YR 4/2) when moist; massive; slightly hard, friable, sticky and plastic; common fine and medium and few coarse roots; few, fine and medium, random tubular pores; strongly calcareous; moderately alkaline (pH 8.4); clear, wavy boundary.

C2ca—14 to 18 inches, light-gray (10YR 7/2) loam, 10 to 15 percent hard lime fragments; brown (10YR 5/3) when moist; massive; hard, friable, sticky and plastic; common fine and medium and few coarse roots; few, fine, random tubular pores; strongly calcareous; moderately alkaline (pH 8.4); gradual, wavy boundary.

C3cam—18 inches, indurated lime-cemented hardpan.

The A1 horizon is 7 to 9 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 2 or 3. The C1ca horizon is loam to heavy loam that is strongly to very strongly calcareous. It has color hue of 10YR or 7.5YR, value of 6 to 8 when dry and 4 to 6 when moist, and chroma of 2 or 3. An indurated lime-cemented hardpan occurs at a depth of 11 to 20 inches.

Pavant cobbly loam, 1 to 6 percent slopes (PEC).—This gently sloping soil is on terraces and fans. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, wildlife habitat, watershed catchment, and woodland. It is not suitable for range seeding because it is shallow and has low water capacity. Capability unit VIIs–U, nonirrigated; Upland Shallow Hardpan (Juniper-Pinyon) range site.

Pavant silt loam, 1 to 3 percent slopes (PdB).—This gently sloping soil occurs on terraces and fans. It has a profile similar to the one described as representative of the series, but the surface layer is silt loam. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for irrigated crops, mainly alfalfa and small grain, but some is used for range and has limited use as woodland. This soil is not suitable for range seeding because it has low water capacity and is shallow. Capability unit VIIs–U, nonirrigated, and IVe–23, irrigated; Upland Shallow Hardpan (Juniper-Pinyon) range site.

Pavant extremely rocky loam, 30 to 40 percent slopes (PFG).—This mapping unit is 60 percent Pavant very cobbly loam, 30 to 40 percent slopes, and 40 percent Rock outcrop. The Pavant soil occurs on mountainsides, and the Rock outcrop occurs mainly on the ridgetops.

The Pavant soil has a profile similar to the one described as representative of the Pavant series, but the surface layer is very cobbly. Runoff is rapid, and the hazard of erosion is high.

This soil is not suitable for clearing and range seeding because it has a very cobbly surface layer and is shallow and steep. Pavant soil—capability unit VIIs–U, nonirrigated; Upland Shallow Hardpan (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Penoyer Series

The Penoyer series consists of deep, gently sloping, well-drained soils on alluvial fans and valley bottoms. These soils formed in alluvium derived from basic igneous material. Penoyer soils are in several places in the northern part of the survey area. They are associated with Kessler and Hiko Peak soils. Elevation ranges from 5,200 to 5,800 feet. Mean annual air temperature is 48° to 49° F, average annual precipitation is 9 to 11 inches, and the frost-free period is 105 to 115 days. The present vegetation is shadscale and a sparse understory of Indian ricegrass, galleta, winterfat, and budsage.

In a representative profile the surface layer is pale-brown silt loam about 5 inches thick. The upper 16 inches of the underlying layer is pale-brown or light yellowish-brown, friable silt loam. The lower part is light yellowish-brown loam.

On Penoyer soils, the hazard of erosion is slight to moderate. The available water capacity is 10 to 11 inches in a 5-foot profile, and the water supplying capacity is 6 to 9 inches. Permeability is moderately slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, watershed catchment, and wildlife habitat. They are not suitable for clearing and range seeding because precipitation is low. Vegetation can be improved by using good range management.

Representative profile of Penoyer silt loam, 1 to 3 percent slopes, 5½ miles west and ½ mile south of Cove Fort, sec. 30, T. 25 S., R. 7 W.

A1—0 to 5 inches, pale-brown (10YR 6/3) silt loam, dark brown (10YR 3/3) when moist; weak, thick, platy structure that parts to moderate, thin, platy; soft, friable, slightly sticky and plastic; few fine and medium, vesicular pores; slightly calcareous; strongly alkaline (pH 8.5); abrupt, smooth boundary.

C1—5 to 10 inches, pale-brown (10YR 6/3) heavy silt loam, brown to dark brown (10YR 4/3) when moist; massive; slightly hard, friable, slightly sticky and plastic; few fine and medium roots; common, fine and few, medium and coarse, tubular pores; strongly calcareous; strongly alkaline (pH 8.5); clear, smooth boundary.

C2—10 to 21 inches, light yellowish-brown (10YR 6/4) silt loam, dark brown to brown (7.5YR 4/4) when moist; massive; slightly hard, friable, slightly sticky and plastic; very few fine and medium roots; common, fine and few, medium and coarse, tubular pores; strongly calcareous; strongly alkaline (pH 8.8); clear, smooth boundary.

C3—21 to 60 inches, light yellowish-brown (10YR 6/4) loam, brown to dark brown (7.5YR 4/4) when moist; massive; slightly hard, friable, slightly sticky and plastic; very few fine and medium roots; few, fine and medium, tubular pores; strongly calcareous; very strongly alkaline (pH 9.2).

The A1 horizon is 4 to 7 inches thick. It has color value of 6 when dry and 3 or 4 when moist and chroma of 2 or 3. The C horizon is dominantly silt loam but is stratified in places with loam, fine gravelly loam, and fine gravelly sandy loam. The gravelly horizons are generally below a depth of 40 inches. They have a color hue of 10YR or 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 2 to 4. Alkali salts (exchangeable sodium) occur in places.

Penoyer silt loam, 1 to 3 percent slopes (PGB).—This gently sloping soil occurs on alluvial fans and valley bottoms. It has the profile described as representative of the series. Runoff is slow, and the hazard of erosion is slight. Included in mapping are two small areas along the northwestern boundary of the survey area (sec. 5, T. 24 S., R. 8 W.). The soil material in these areas is sand that has formed hummocks as much as 3 feet high. Juniper and four-wing saltbush are the dominant vegetation. Capability unit VIIe–S, nonirrigated; Semidesert Silt Loam range site.

Penoyer-Hiko Peak association, 1 to 10 percent slopes (PHD).—This mapping unit is 60 percent Penoyer silt loam, 1 to 3 percent slopes, and 40 percent Hiko Peak cobbly loam, 2 to 10 percent slopes. The Penoyer soil is on the valley bottoms, and the Hiko Peak soil is on alluvial fans.

Runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are not suitable for clearing and reseeding because precipitation is low. Penoyer soil—capability unit VIIe–S, nonirrigated, Semidesert Silt Loam range site; Hiko Peak soil—capability unit VIIs–S, nonirrigated, Semidesert Stony Loam range site.

Phage Series

The Phage series consists of deep, moderately sloping to very steep, somewhat excessively drained soils. These soils are on terraces, dissected fans, hills, and mountains. They formed in alluvium derived from intermediate igneous and mixed sedimentary material. Phage soils occur throughout the survey area. They are associated with Red Butte, Ushar, Black Ridge, and Pass Canyon soils. Elevation ranges from 5,900 to 6,800 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, big sagebrush, yellowbrush, bluebunch wheatgrass, squirreltail, Indian ricegrass, needleandthread, Sandberg bluegrass, and annual forbs. The grasses are sparse.

In a representative profile the surface layer is brown loam about 6 inches thick. The Upper 17 inches of the underlying layer is light brownish-gray or very pale brown, friable loam or gravelly loam. The lower part is very pale brown very gravelly sandy loam. Layers of strong lime accumulation occur at a depth of 6 to 14 inches.

Phage soils are moderately to severely eroded. The available water capacity is 4 to 5.5 inches, and the water supplying capacity is 6 to 9 inches. Permeability is moderately rapid. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, woodland, and watershed catchment and have limited use as woodland. A small acreage is in irrigated crops. These soils are suitable for clearing and range seeding if such practices are needed.

Representative profile of Phage loam, 3 to 10 percent slopes, eroded, 0.8 mile west and ½ mile north of Manderfield, SW¼SW¼ sec. 16, T. 28 S., R. 7 W.

A1—0 to 6 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; weak, very fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine, medium, and coarse roots; few, fine and medium, tubular pores; slightly calcareous; moderately alkaline (pH 8.4); abrupt, smooth boundary.

C1ca—6 to 13 inches, light brownish-gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) when moist; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common, fine, medium, and coarse roots; few, fine, tubular pores; strongly calcareous; moderately alkaline (pH 8.4); clear, smooth boundary.

C2ca—13 to 23 inches, very pale brown (10YR 8/2) gravelly loam, very pale brown (10YR 7/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and coarse roots; few, fine, tubular pores; very strongly calcareous; moderately alkaline (pH 8.4); clear, smooth boundary.

C3ca—23 to 45 inches, very pale brown (10YR 8/3) very gravelly sandy loam, pale brown (10YR 7/3) when moist; massive; strongly cemented; few fine roots; no pores; very strongly calcareous; moderately alkaline (pH 8.4); irregular, wavy boundary.

C4ca—45 to 58 inches, very pale brown (10YR 7/3) very gravelly sandy loam, pale brown (10YR 6/3) when moist; single grained; loose; nonsticky and nonplastic; few fine roots; strongly calcareous; moderately alkaline (pH 8.4); clear, wavy boundary.

C5ca—58 to 63 inches, very pale brown (10YR 8/3) very gravelly sandy loam, pale brown (10YR 6.5/3) when moist; massive; strongly cemented; very strongly calcareous; strongly alkaline (pH 8.5); clear, wavy boundary.

The A1 horizon is 2 to 6 inches thick. It has color value of 5 and 3 when moist and chroma of 2 or 3. The C horizon has color hue of 10YR or 7.5YR, value of 6 to 8 when dry and 4 through 7 when moist, and chroma of 2 or 3. Textures range from gravelly or very gravelly loam to gravelly or very gravelly sandy loam and sand. Cobbles occur in some places, and in a few places there are thin nongravelly horizons. The average content of gravel of the C horizon, between depths of 10 and 40 inches, is 50 percent or more.

Phage loam, 3 to 10 percent slopes, eroded (PID2).—This gently rolling to rolling soil is on terraces and dissected fans. It has the profile described as representative of the series. It is moderately eroded. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, wildlife habitat, and watershed catchment and has limited use as woodland. Clearing, brush management, and range seeding are successful on this soil where needed. Capability unit VIe–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Phage gravelly loam, 3 to 10 percent slopes, eroded (PkD2).—This gently rolling and rolling soil is on dissected fans and terraces. It has a profile similar to the one described as representative of the series, but the surface layer is 20 to 50 percent gravel. Runoff is slow to medium, and the hazard of erosion is slight to moderate. Included in mapping are small areas of soil that is similar to this Pharo soil but that is moderately deep to gravel.

Except in areas that have been abandoned because of water shortage, this soil is used almost entirely for crops. Among the crops are alfalfa and small grain. Capability unit IVe–24, irrigated, and VIe–U, nonirrigated; Upland Gravelly Loam range site.

Phage cobbly loam, 3 to 30 percent slopes, eroded (PLF2).—This soil is gently rolling to steep and is on dissected fans, terraces, rolling hills, and mountain slopes. It has a profile similar to the one described as representative of the series, but the surface layer is 20 to 40 percent cobbles. Runoff is medium to rapid, and the hazard of erosion is moderate to high. The cobbly surface layer imposes some limitations on the seeding of range grasses. Capability unit VIe–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Phage cobbly loam, 30 to 50 percent slopes, eroded (PLG2).—This soil is steep and very steep and is on mountain slopes. It occurs in several small areas in the southern and southeastern parts of the survey area. It has a profile similar to the one described as representative of the series, but the surface layer is 20 to 50 percent cobbles. Runoff is rapid, and the hazard of erosion is high. Included in mapping are small areas of Ushar soils.

Range clearing and seeding is not practical because this soil is steep and has a cobbly surface layer. Brush management may be practical where grass cover is adequate and the stand of trees is not too dense. Capability unit VIIe–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Phage very cobbly loam, 3 to 30 percent slopes, eroded (PMF2).—This soil is gently rolling to steep and is on dissected fans, terraces, rolling hills, and mountain slopes. It has a profile similar to the one described as representative of the series, but the surface layer is 50 to 80 percent cobbles. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, wildlife habitat, watershed catchment, and to a limited extent woodland. Clearing and range seeding are difficult because the surface layer is very cobbly. Vegetation can be improved through good range management. Capability unit VIIs–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Phage very rocky loam, 30 to 60 percent slopes, eroded (PNG2).—This mapping unit is 65 percent Phage very cobbly loam, 30 to 60 percent slopes, eroded; 20 percent Rock outcrop; and 15 percent Phage very cobbly loam, 3 to 30 percent slopes, Ushar very cobbly loam, 5 to 30 percent slopes, and Red Butte very cobbly loam, 3 to 30 percent slopes, eroded. Phage very cobbly loam, 30 to 60 percent slopes, eroded, is steep and very steep and is on mountains. It has a profile similar to the one described as representative of the series, but the surface layer is 50 to 80 percent cobbles. Runoff is rapid, and the hazard of erosion is high.

This mapping unit is not suitable for clearing and range seeding because it is very steep, has a very cobbly surface layer, and is associated with Rock outcrop. Brush management may be beneficial where grass cover is adequate and the stand of trees is not too dense. Vegetation can be improved by good range management. Phage soil—capability unit VIIs–U, nonirrigated, and Upland Stony Loam (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Phage-Black Ridge association, 3 to 30 percent slopes, eroded (POF2).—This mapping unit is about 60 percent Phage very cobbly loam, 3 to 30 percent slopes, eroded; 35 percent Black Ridge very cobbly silt loam, 6 to 30 percent slopes; and 5 percent Rock outcrop. The Phage soils are mainly steep and on hillsides and ridgetops. Black Ridge soil is mainly in depressed areas.

Phage soil has a profile similar to the one described as representative of the series, but the surface layer is 50 to 80 percent cobbles. Runoff is medium, and the hazard of erosion is moderate.

These soils are used for range, wildlife habitat, and watershed catchment, and have limited use as woodland. They are not suitable for clearing and range seeding because they have a very cobbly surface layer and are associated with Rock outcrop. Vegetation can be improved by good range management. Phage soil—capability unit VIIs–U, nonirrigated, and Upland Stony Loam (Juniper-Pinyon) range site; Black

Ridge soil—capability unit VIIs–U, nonirrigated, and Upland Shallow Hardpan (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Phage-Pass Canyon association, 3 to 30 percent slopes, eroded (PPF2).—This mapping unit is 60 percent Phage cobbly loam, 3 to 30 percent slopes, eroded, and 40 percent Pass Canyon gravelly loam, 5 to 30 percent slopes, eroded. The Phage soil is mainly on alluvial fans and ridges. The Pass Canyon soil is mainly on ridgetops.

The Phage soil has a profile similar to the one described as representative of the Phage series, but the surface layer is 20 to 40 percent cobbles. The Pass Canyon soil has a profile similar to the one described as representative of the Pass Canyon series, but the surface layer is gravelly loam. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Included in mapping are small areas of Rock outcrop, river gravel, and sand.

This mapping unit is used for range, wildlife habitat, and watershed catchment and has limited use as woodland. The Phage soil in this association is suitable for clearing and range seeding where such practices are necessary, but the Pass Canyon soil is not suitable because it has low water capacity and is shallow. Phage soil capability unit VIe–U, nonirrigated, and Upland Stony Loam (Juniper-Pinyon) range site; Pass Canyon soil—capability unit VIIs–U, nonirrigated, and Upland Stony Hills (Juniper-Pinyon) range site.

Phage-Red Butte association, 3 to 30 percent slopes, eroded (PRF2).—This mapping unit is about 55 percent Phage cobbly loam, 3 to 30 percent slopes, eroded, and 35 percent Red Butte cobbly loam, 5 to 30 percent slopes, eroded. There is no uniformity of occurrence. The Phage soil has a profile similar to the one described as representative of the Phage series, but the surface layer is 20 to 40 percent cobbles. The Red Butte soil has a profile similar to the one described as representative of the Red Butte series, but the surface layer is cobbly. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping are areas of Ushar cobbly loam, 3 to 30 percent slopes, eroded, that make up about 10 percent of the acreage, and small areas of Red Butte very cobbly loam, 3 to 50 percent slopes, eroded. Also included are areas of alluvial land and of a soil similar to Phage soil but that has a hardpan between depths of 20 and 36 inches.

These soils are used for range, wildlife habitat, and watershed catchment and have limited use as woodland. They are suitable for clearing and range seeding where such practices are needed. Drill seeding of range is difficult because the surface layer is cobbly. Capability unit VIe–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Phage-Ushar complex, 3 to 30 percent slopes, eroded (PSF2).—This mapping unit is about 40 percent Phage cobbly loam, 3 to 30 percent slopes, eroded; 30 percent Phage very cobbly loam, 3 to 30 percent slopes, eroded; and 20 percent Ushar cobbly loam, 3 to 30 percent slopes, eroded. The Phage soils are mainly on ridges, rolling hilltops, and steep side slopes. The Ushar soil is mainly in small valleys and on the more gentle side slopes, but in places it occurs on steep side slopes.

The Phage soils have a profile similar to the one described as representative of the Phage series, but the surface layer is cobbly or very cobbly. The Ushar soil has a profile similar to the one described as representative of the Ushar series, but the surface layer is cobbly. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping are areas of Red Butte very cobbly loam, 3 to 30 percent slopes, eroded, which make up 5 percent of the acreage, and areas of Deer Creek cobbly loam, 3 to 30 percent slopes, eroded, which make up 5 percent of the acreage. Also included are small areas of Flowell cobbly loam, 6 to 30 percent slopes, and Rock outcrop.

These soils are used for range, wildlife habitat, and watershed catchment, and have limited use as woodland. They are suitable for range clearing and seeding where such practices are needed, but range on the Phage soils in this complex is difficult to seed because the cobbles are so numerous. Capability unit VIe–U, nonirrigated. Phage soils—Upland Stony Loam (Juniper-Pinyon) range site, and Ushar soil—Upland Loam (Juniper-Pinyon) range site.

Pharo Series

The Pharo series consists of deep, gently sloping to steep, somewhat excessively drained soils on dissected fans, terraces, hills, and mountains. These soils formed in alluvium derived from mixed sedimentary and intermediate igneous material. Pharo soils occur in several places throughout the survey area, mainly in Millard County. They are associated with Mill Hollow and Ushar soils. Elevation ranges from 5,900 to 6,400 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The present vegetation includes big sagebrush, juniper, bluebunch wheatgrass, squirreltail, Indian ricegrass, yellowbrush, and annual weeds.

In a representative profile the surface layer is grayish-brown very cobbly loam and gravelly loam about 8 inches thick. The upper 20 inches of the underlying layer is light-gray, loose very gravelly coarse sandy loam. Horizons of strong lime accumulation occur between depths of 7 and 15 inches and are generally thicker than 30 inches. The lower part of the underlying layer is white gravelly silt loam.

Pharo soils are slightly to moderately eroded. The available water capacity is 4 to 5 inches in a 5-foot profile, and the water supplying capacity is 8 to 11 inches. Permeability is moderately rapid. Roots can penetrate to a depth of more than 5 feet.

These soils are used mainly for range, wildlife habitat, and watershed catchment and have limited use as woodland, but a small acreage is used for irrigated and nonirrigated crops. These soils are suitable for clearing, brush management, and range seeding where such practices are needed.

Representative profile of Pharo very cobbly loam, 3 to 30 percent slopes, 5½ miles north and 3 miles west of Cove Fort, sec. 34, T. 24 S., R. 7 W.

A11—0 to 2 inches, grayish-brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; few, fine, tubular pores; moderately calcareous; moderately alkaline (pH 8.0); abrupt, smooth boundary.

A12—2 to 8 inches, grayish-brown (10YR 5/2) gravelly loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and few medium roots; few, fine, tubular pores; strongly calcareous; moderately alkaline (pH 8.2); clear, wavy boundary.

C1ca—8 to 29 inches, light-gray (10YR 7/2) very gravelly coarse sandy loam, pale brown (10YR 6/3) when moist; massive; loose, very friable, nonsticky and nonplastic; few fine and medium roots; interstitial pores; very strongly calcareous; moderately alkaline (pH 8.4); gradual, wavy boundary.

C2ca—29 to 60 inches, white (10YR 8/2) gravelly silt loam, light yellowish brown (10YR 6/4) when moist; massive; weakly cemented, friable, slightly sticky and slightly plastic; very few fine roots; very few, fine, tubular pores; very strongly calcareous; moderately alkaline (pH 8.4).

The A1 horizon is 7 to 10 inches thick. It has color value of 5 when dry and 3 when moist and chroma of 2 or 3. The C horizon, at a depth between 10 and 40 inches, is generally very gravelly coarse sandy loam or gravelly silt loam, but in some places the upper 8 to 10 inches is free of gravel. It has color hue of 10YR and 7.5YR, value of 6 through 8 when dry and 4 to 6 when moist, and chroma of 3 or 4. The C horizon is 40 to 70 percent gravel. The horizon of lime accumulation occurs at depths between 7 and 15 inches and is more than 30 inches thick.

Pharo loam, 1 to 3 percent slopes (P†B).—This gently sloping soil is on terraces, benches, and fans. It has a profile similar to the one described as representative of the series, but the surface layer lacks cobbles and the upper 10 to 15 inches is free of gravel. The surface layer is 8 to 10 inches thick. Runoff is slow, and the hazard of erosion is slight. Included in mapping are small areas that are free of gravel between depths of 15 and 30 inches.

This soil is used for range, wildlife habitat, and watershed catchment and has limited use as woodland. A small area is used for irrigated crops of small grain and alfalfa. Capability unit IIIs–24, irrigated, and VIe–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Pharo loam, 3 to 10 percent slopes (P†D).—This gently rolling and rolling soil is on dissected fans and terraces. It has a profile similar to the one described as representative of the series, but the surface layer is free of cobbles and is 8 to 10 inches thick. Runoff is medium, and the hazard of erosion is moderate. The present native vegetation is mainly big sagebrush and grasses but little or no juniper.

This soil is used for range, wildlife habitat, watershed catchment, and irrigated and nonirrigated crops. Irrigated crops include alfalfa and small grain. In nonirrigated areas, a wheat-fallow cropping system is used. Capability unit IVe–24, irrigated, and VIe–U, nonirrigated; Upland Gravelly Loam range site.

Pharo loam, 3 to 10 percent slopes, eroded (PUD2).—This gently rolling and rolling soil is on hills, dissected fans, and terraces. It is similar to the soil described as representative of the series, but it is moderately eroded. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

Clearing, brush management, and range seeding are practical if they are needed. Seedings of crested wheatgrass have been successful on this soil. This soil is used for range, wildlife habitat, and watershed catchment and has limited use as woodland. Capability unit VIe–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Pharo very cobbly loam, 3 to 30 percent slopes (PVF).—This soil is in gently sloping to steep areas on mountains and rolling areas on hills and ridges. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate.

This soil is not suitable for range seeding with drills because it has a very cobbly surface layer. Brush management may be beneficial where the stand of trees is not too dense and the understory of grass is adequate. This mapping unit is used for wildlife habitat, range, and watershed catchment and has limited use as woodland. Capability unit VIIs–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Pharo-Ushar association, 3 to 30 percent slopes, eroded (PWF2).—This mapping unit is 80 percent Pharo cobbly loam, 3 to 30 percent slopes, eroded, and 20 percent Ushar loam, 3 to 10 percent slopes, eroded. The Pharo soil is on mountainsides and ridgetops. The Ushar soil is on fans and in small valleys.

The Pharo soil has a profile similar to the one described as representative of the series, but the surface layer is 20 to 40 percent cobbles. Pharo soil is moderately eroded, and Ushar soil is moderately to severely eroded. Runoff on the soils of this association is medium to rapid, and the hazard of erosion is moderate to high.

These soils are used mainly for range, wildlife habitat, and watershed catchment and have limited use as woodland. Closed stands of juniper occur on Ushar soils. Clearing and range seeding on the soils of this association are beneficial, but seeding is difficult because the surface layer is cobbly. Pharo soil—capability unit VIe–U, nonirrigated, and Upland Stony Loam (Juniper-Pinyon) range site; Ushar soil—capability unit IVe–UZ, nonirrigated, and Upland Loam (Juniper-Pinyon) range site.

Poganeab Series

The Poganeab series consists of deep, gently sloping, poorly drained soils that are moderately affected by salts. These soils formed in alluvium derived from mixed material. They are on flood plains and alluvial fans. Poganeab soils are in the valley bottom between Beaver and Adamsville, and west of Manderfield. Elevation ranges from 5,700 to 6,000 feet. Mean annual air temperature is 47° to 49° F, average annual precipitation is 10 to 12 inches, and the frost-free period is 105 to 115 days. The vegetation is meadow grasses and sedges.

In a representative profile the surface layer is light brownish-gray clay loam about 7 inches thick. The underlying layer is grayish-brown or light brownish-gray, firm clay loam, silty clay loam, and sandy clay loam. Mottles generally occur throughout the profile.

On Poganeab soils, there is little or no erosion. The available water capacity is 11 to 12 inches in a 5-foot profile. Permeability is slow. Roots can penetrate to a depth of 60 inches or more. The water table may be near the surface but maybe as much as about 30 inches below the surface, depending on the season and the amount of water applied to this and adjacent soils.

These soils are used mainly for meadow hay and pasture and, at present, are suitable only for these uses. Reclamation of these soils is difficult, but where drained and leached of salts they are suited to irrigated alfalfa and small grain.

Representative profile of Poganeab clay loam, 1 to 3 percent slopes, 800 feet south of Adamsville Town Road, sec. 30, T. 29 S., R. 8 W.

O1—2 inches to 0, meadow sod containing some mineral soil.

A1—0 to 7 inches, light brownish-gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) when moist; many, fine, faint, dark yellowish-brown (10YR 3/4) mottles; weak, coarse, prismatic structure that parts to moderate, fine, blocky; hard, firm, stocky and plastic; many fine roots; few fine pores; moderately alkaline (pH 8.3); abrupt, wavy boundary.

C1—7 to 15 inches, light brownish-gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) when moist; many, fine, distinct, dark yellowish-brown (10YR 4/4) mottles; weak, coarse, prismatic structure that parts to moderate, fine, blocky; hard, firm, stocky and plastic; common fine roots; few fine pores; strongly calcareous; moderately alkaline (pH 8.5); clear, wavy boundary.

C2—15 to 27 inches, grayish-brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; few, fine, faint, dark-brown (10YR 3/3) mottles; moderately coarse, blocky structure that parts to fine, blocky; hard, firm, sticky and plastic; common fine roots; few medium pores; moderately calcareous; moderately alkaline (pH 8.3); clear, wavy boundary.

C3—27 to 38 inches, grayish-brown (10YR 5/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; few, fine, faint, dark-brown (10YR 3/3) mottles; moderate, medium, angular blocky structure that parts to fine, angular blocky, very hard, very firm, sticky and plastic; few fine roots; few fine pores; strongly calcareous; moderately alkaline (pH 8.0); clear, wavy boundary.

C4—38 to 60 inches, light brownish-gray (10YR 6/2) sandy clay loam, dark gray (10YR 3.6/2) when moist; common, coarse, distinct, grayish-brown (2.5Y 5/2) mottles; massive; hard, firm, sticky and plastic; strongly calcareous; moderately alkaline (pH 8.0).

The O1 horizon is lacking in places. The A1 horizon is clay loam marginal to silty clay loam. It has color value of 6 or 7 when dry and 5 or 6 when moist and chroma of 2 or 3. The C horizon, between depths of 10 and 40 inches, is generally clay loam or silty clay loam, but below a depth of 20 inches, strata of fine sandy loam or loam can occur. This horizon has color value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 or less.

Poganeab clay loam, 1 to 3 percent slopes (PxB).—This soil has the profile described as representative of the series. Runoff is slow, and the hazard of erosion is slight. Included in mapping are areas of a soil that is similar to this Poganeab soil but has a deep water table. Capability unit Vw–27, irrigated.

Poganeab clay loam, deep over clay, 1 to 3 percent slopes (PyB).—This soil has a profile similar to the one described as representative of the series, but at a depth of about 40 inches is a very slowly permeable clay layer. This layer makes drainage, and leaching of salts difficult. Runoff is slow, and the hazard of erosion is slight. Included in mapping are small areas that have slopes of 4 percent. Capability unit Vw–27, irrigated.

Red Butte Series

The Red Butte series consists of deep, moderately sloping to very steep, well-drained soils on mountainsides and hills. These soils formed in colluvium and alluvium derived from intermediate igneous material. Red Butte soils are in several places throughout the survey area on low mountains and rolling foothills. They are associated with Deer Creek, Pharo, Pass Canyon, and Flowell soils, the McQuarrie variant and Rock outcrop. Elevation ranges from 6,000 to 6,800 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, pinyon, bitterbrush, bluegrass, and bluebunch wheatgrass.

In a representative profile the surface layer is dark grayish-brown very cobbly loam about 3 inches thick. The subsoil is brown, firm cobbly clay loam about 13 inches thick. The underlying layer is white and pinkish-white very strongly calcareous very cobbly sandy loam.

Red Butte soils are moderately eroded. The available water capacity is 5 to 6.5 inches in a 5-foot profile, and the water supplying capacity is 8 to 11 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for watershed catchment, range, and wildlife habitat. Where they are not too steep they are suitable for clearing and range seeding if these practices are needed. The surface layer is not too cobbly, and there is no rock outcrop; nevertheless, range seeding is difficult.

Representative profile of Red Butte very cobbly loam, 3 to 50 percent slopes, eroded, 18 miles north of Beaver, SW½NW¼ sec. 34, T. 26 S., R. 7 W.

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) very cobbly loam, very dark brown (10YR 2/2) when moist; weak, medium, platy structure that parts to weak, fine, platy; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; vesicular pores; moderately alkaline (pH 8.4); abrupt, smooth boundary.

B1—3 to 8 inches, very dark grayish-brown (10YR 3/2) cobbly loam, very dark brown (10YR 2/2) when moist; weak, medium, blocky structure; slightly hard, friable, slightly sticky and plastic; many fine and medium and few coarse roots; common, fine and medium, tubular pores; thin, patchy clay films; moderately alkaline (pH 8.4); clear, smooth boundary.

B2t—8 to 16 inches, brown (7.5YR 5/4) cobbly clay loam, brown to dark brown (7.5YR 4/2) when moist; moderate, coarse, angular blocky structure that parts to moderate, fine, blocky; very hard, firm,

sticky and plastic; common fine and medium and few large roots; common, fine and medium, and few, coarse, tubular pores; thin, patchy clay films; moderately alkaline (pH 8.4); clear, wavy boundary.

C1ca—16 to 20 inches, white (8.0) cobbly sandy loam that is strongly cemented with lime, pinkish gray (7.5YR 7/2) when moist; massive; friable, slightly sticky and nonplastic; common fine and medium roots; few medium pores; very strongly calcareous; strongly alkaline (pH 8.6); gradual, smooth boundary.

C2ca—20 to 60 inches, pinkish-white (7.5YR 8/2) very cobbly sandy loam, light brown (7.5YR 6/4) when moist; massive; weakly cemented, friable, slightly sticky and nonplastic; few fine and medium roots; few, fine, tubular pores; very strongly calcareous; strongly alkaline (pH 8.6).

The A1 horizon is 2 to 6 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 2. The B2t horizon has color hue of 7.5YR or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 through 4. Dark color value of less than 3.5 extends to a depth of 8 inches or more. This horizon is cobbly clay loam that is 30 to 50 percent coarse fragments. It is 10 to 16 inches thick. The C horizon is strongly to very strongly calcareous sandy loam or loam that is either cobbly or very cobbly and is 20 to 60 percent coarse fragments. In places bedrock occurs at depths between 40 and 60 inches.

Red Butte very cobbly loam, 3 to 50 percent slopes, eroded (RBG2).—This sloping to very steep soil occurs on rolling hills and on mountainsides. It has the profile described as representative of the series. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

This soil is used for watershed catchment, range, and wildlife habitat. It is not suitable for clearing and range seeding with a drill because the surface layer is very cobbly and in places the soil is very steep. Capability unit VIIs–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Red Butte very rocky loam, 30 to 50 percent slopes, eroded (RCG2).—This mapping unit is 80 percent Red Butte very cobbly loam, 30 to 50 percent slopes, eroded, and 20 percent Rock outcrop. Runoff is rapid, and the hazard of erosion is high.

This soil is used for watershed catchment, range, and wildlife habitat. A small amount of Gambel oak is included in the vegetation. This soil is not suitable for clearing and seeding because it is very steep and has a very cobbly surface, and part of the unit is Rock outcrop. Red Butte soil—capability unit VIIs–U, nonirrigated, and Upland Stony Loam (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Red Butte association, 3 to 60 percent slopes, eroded (RDG2).—This mapping unit is 60 percent Red Butte very cobbly loam, 3 to 30 percent slopes, eroded, that is deep to bedrock, and 40 percent McQuarrie very cobbly loam, coarse textured subsoil variant, 30 to 60 percent slopes. These soils are intermixed, but the McQuarrie variant is in steeper areas. The Red Butte soil has a profile similar to the one described as representative of the Red Butte series, but it is underlain at a depth of 40 to 60 inches by bedrock. The McQuarrie soil has the profile described as representative of the McQuarrie coarse textured subsoil variant. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Included in mapping are small areas of soil that is similar to this Red Butte soil but that has bedrock at a depth of about 30 inches. Also included are a few areas of Rock outcrop.

These soils are used for range, watershed catchment, and wildlife habitat. They are not suitable for clearing and range seeding with drills because they are steep and have a very cobbly surface layer. Capability unit VIIs–U, nonirrigated; Red Butte soil—Upland Stony Loam (Juniper-Pinyon) range site; McQuarrie variant—Upland Stony Hills (Juniper-Pinyon) range site.

Red Butte-Deer Creek association, 30 to 50 percent slopes, eroded (REG2).—This mapping unit is 50 percent Red Butte very cobbly loam, 30 to 50 percent slopes, eroded; 30 percent Deer Creek very cobbly loam, 30 to 50 percent slopes, eroded; and 15 percent Rock outcrop. The Red Butte soil occurs mainly at a lower elevation, the Deer Creek soil occurs at a higher elevation and on north-facing slopes.

Deer Creek soil has a profile similar to the one described as representative of the Deer Creek series, but the surface layer is very cobbly. Runoff is rapid, and the hazard of erosion is high.

Included with these soils in mapping are areas of Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, eroded, that make up 5 percent of the acreage, and small areas of Red Butte and Deer Creek very cobbly loams that have slopes of less than 30 percent.

These soils are used for watershed catchment, range, and wildlife habitat. They are not suitable for clearing and range seeding because they are very steep and have a very cobbly surface layer, and part of the unit is Rock outcrop. Red Butte soil—capability unit VIIs–U, nonirrigated, and Upland Stony Loam (Juniper-Pinyon) range site; Deer Creek soil—capability unit VIIs–U, nonirrigated, and Upland Loam (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Red Butte-Flowell association, 3 to 30 percent slopes, eroded (RFF2).—This mapping unit is 60 percent Red Butte very cobbly loam, 3 to 30 percent slopes, eroded, and 40 percent Flowell very cobbly loam, 10 to 30 percent slopes, eroded. There is no uniformity in pattern of occurrence for these soils.

The Red Butte soil has the profile described as representative of the Red Butte series. The Flowell soil has a profile similar to the one described as representative of the Flowell series, but the surface layer is very cobbly. Runoff is medium, and the hazard of erosion is moderate. Included in mapping are small areas of Red Butte and Flowell soils that have slopes up to 50 percent.

These soils are used for range, watershed catchment, woodland, and wildlife habitat. They may be suitable for clearing and range seeding where such practices are needed, but the use of drilling equipment is restricted because the surface layer is very cobbly. Capability unit VIIs–U, nonirrigated; Red Butte soil—Upland Stony Loam (Juniper-Pinyon) range site; Flowell soil—Upland Loam (Juniper-Pinyon) range site.

Red Butte-Phage association, 3 to 30 percent slopes, eroded (RGF2).—This mapping unit is 60 percent Red Butte very cobbly loam, 3 to 30 percent slopes, eroded, and 40 percent Phage very cobbly loam, 3 to 30 percent slopes, eroded. The Red Butte soil is mainly on hills and ridgetops or on long, gentle slopes. The Phage soil is mainly on steep side slopes and in natural waterways. There is no uniformity in pattern of occurrence for these soils.

The Phage soil has a profile similar to the one described as representative of the Phage series, but the surface layer is very cobbly. Runoff is medium, and the hazard of erosion is moderate. Included in mapping are small areas of Ushar loam, cobbly loam, and very cobbly loam.

These soils are used for watershed catchment, range, woodland, and wildlife habitat. They are suitable for clearing and range seeding where such practices are needed. Use of drilling equipment is restricted because the surface layer is very cobbly. Capability unit VIIs–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Red Rock Series

The Red Rock series consists of deep, gently sloping, well-drained soils on flood plains and alluvial valleys. These soils formed in alluvium derived from mixed sedimentary and igneous material. Red Rock soils are in the Pine Creek area, near Cove Fort, and 5 to 8 miles northwest of Cove Fort. Elevation ranges from 5,900 to 6,400 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is big sagebrush, squirreltail, bluebunch wheatgrass, and desert mallow.

In a representative profile the surface layer is grayish-brown silt loam and dark grayish-brown silty clay loam about 8 inches thick. The subsoil is brown, firm silty clay loam about 20 inches thick. The underlying layer is pale-brown, firm silty clay loam.

On Red Rock soils, the hazard of erosion is moderate. The available water capacity is 10 to 12 inches in a 5-foot profile, and the water supplying capacity is 10 to 13 inches. Permeability is moderate. Roots can penetrate to a depth of more than 5 feet.

These soils are used for watershed catchment, range, wildlife habitat, and nonirrigated crops. They are suitable for brush management, clearing, and range seeding where such practices are needed.

Representative profile of Red Rock silt loam, 1 to 3 percent slopes, 5½ miles north and 3 miles west of Cove Fort, sec. 34, T. 24 S., R. 7 W.

A11—0 to 3 inches, grayish-brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) when moist; moderate, fine, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and plastic; few fine roots; many, fine and medium, tubular pores; mildly alkaline (pH 7.8); abrupt, smooth boundary.

A12—3 to 8 inches, dark grayish-brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, subangular blocky structure; very hard, friable, slightly sticky and plastic; common fine and medium roots; few, fine, tubular pores; mildly alkaline (pH 7.8); clear, smooth boundary.

B21—8 to 18 inches, brown (10YR 5/3) silty clay loam, dark brown (7.5YR 3/2) when moist; moderate, medium, subangular blocky structure; very hard, firm, sticky and plastic; few fine and medium roots; common, fine and medium, tubular pores; thin, patchy clay films in pores; moderately alkaline (pH 8.0); gradual, wavy boundary.

B22—18 to 28 inches, brown (10YR 5/3) silty clay loam, dark brown (10YR 3/3) when moist; weak, medium, prismatic structure; very hard, firm, sticky and plastic; few fine and medium roots; common, fine, and few, medium, tubular pores; thin, patchy clay films in pores; moderately alkaline (pH 8.0); gradual, wavy boundary.

C—28 to 60 inches, pale-brown (10YR 6/3) silty clay loam, brown to dark brown (10YR 4/3) when moist; massive; very hard, firm, slightly sticky and plastic; few fine roots; few, fine, tubular pores; moderately calcareous; lime as flecks and mycelia; moderately alkaline (pH 8.4).

The A1 horizon is 4 to 9 inches thick. It has color hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 when moist, and chroma of 2 or 3. The B2 horizon is heavy silt loam to silty clay loam. It has color hue of 10YR or 7.5YR, value of 5 when dry and 3 when moist, and chroma of 2 or 3. The B2 horizon is 12 to 24 inches thick. The horizon of lime accumulation is between 18 and 24 inches from the surface.

Red Rock silt loam, 1 to 3 percent slopes (RhB).—This gently sloping soil occurs on alluvial fans. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate. Included in mapping are small areas of Ushar loam, 1 to 3 percent slopes, moderately eroded. Capability unit IVe–UZ, nonirrigated; Upland Loam range site.

Riverwash

Riverwash (RK) is a land type that consists dominantly of gravelly, cobbly, or stony coarse textured soil material. It is in narrow drainageways in the southwestern part of the survey area and also at the northern edge of the survey area in Millard County. The material varies considerably within a short distance. It is moved from place to place each year, because flooding takes place during thunderstorms and spring snowmelt. There is some sparse vegetation consisting of rabbitbrush, big sagebrush, juniper, and annual weeds.

This land has little or no value for farming. Capability unit VIIIw–4.

Rob Roy Series

The Rob Roy series consists of moderately deep, gently sloping to steep, well-drained soils on mountain side slopes. These soils formed in residuum derived from intermediate igneous material. Rob Roy soils are west of U.S. Highway 91 near the overpass south of Pine Creek. Elevation ranges from 6,500 to 7,500 feet. Mean annual air temperature is 40° to 44° F, average annual precipitation is about 14 to 18 inches, and the frost-free period is 80 to 100 days. The vegetation is big sagebrush, Gambel oak, yellowbrush, bitterbrush, cheatgrass, and bluebunch wheatgrass.

In a representative profile the surface layer is grayish-brown very cobbly loam about 8 inches thick. The subsoil is brown, very firm light clay about 11 inches thick. The underlying layer is light-brown, firm noncalcareous cobbly clay loam that is underlain at a depth of 31 inches by bedrock.

The available water capacity is about 5 inches above the bedrock, and the water supplying capacity is 7 to 9 inches. Permeability is slow. The growth of roots is restricted by bedrock.

These soils are used for range, wildlife habitat, and watershed catchment. They are suitable for clearing, brush management, and range seeding where such practices are needed.

Representative profile of Rob Roy very cobbly loam, 10 to 30 percent slopes, in an area of Rob Roy very rocky loam, 10 to 30 percent slopes, 8.5 miles north of Manderfield; 0.2 mile north and 0.2 mile west of the southeast corner of sec. 9, T. 27 S., R. 7 W.

A1—0 to 8 inches, grayish-brown (10YR 5/2) very cobbly loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; common, fine and medium, tubular pores; mildly alkaline (pH 7.8); clear, smooth boundary.

B2t—8 to 19 inches, brown (7.5YR 5/4) light clay, dark brown (7.5YR 3/2) when moist; moderate, medium, angular blocky structure that parts to moderate, fine, angular blocky; very hard, very firm, sticky and plastic; common fine and medium roots; few, fine, tubular pores; moderate, continuous clay films; mildly alkaline (pH 7.6); gradual, wavy boundary.

C—19 to 31 inches, light-brown (7.5YR 6/4) cobbly clay loam, brown to dark brown (7.5YR 4/4) when moist; massive; hard, firm, sticky and plastic; few fine roots; few, fine, tubular pores; mildly alkaline (pH 7.6); gradual, irregular boundary.

R—31 inches, partly weathered bedrock.

The A1 horizon is 7 to 10 inches thick. It has color hue of 10YR and 7.5YR, value of 4 or 5 when dry and 2 when moist, and chroma of 2. The B2t horizon is heavy clay loam to light clay that is 8 to 20 inches thick. It has color value of 5 or 6 when dry and 3 or 4 when moist and chroma of 2 through 4. The C horizon is 20 to 30 percent cobbles. Bedrock is at a depth of 20 to 36 inches.

Rob Roy loam, 1 to 15 percent slopes (RLE).—This gently sloping to moderately steep soil is on mountain side slopes. It has a profile similar to the one described as representative of the series, but the surface layer of loam is 1 to 2 inches thicker and is free of cobbles. Runoff is medium, and the hazard of erosion is moderate. Included in mapping are some small areas of a deep, medium-textured soil that formed in alluvium and a few areas of Rock outcrop.

This mapping unit is used for range, watershed catchment, and wildlife habitat. It is suitable for clearing and range seeding where such practices are needed. Capability unit VIe–U, nonirrigated; Upland Loam range site.

Rob Roy very cobbly loam, 10 to 30 percent slopes (RMF).—This soil is on mountains. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for range, wildlife habitat, and watershed catchment. Range seeding by drill is not practical because the surface layer is very cobbly. Capability unit VIIs–U, nonirrigated; Upland Loam range site.

Rob Roy very rocky loam, 10 to 30 percent slopes (RNF).—This mapping unit is 80 percent Rob Roy very cobbly loam, 10 to 30 percent slopes, and 20 percent Rock outcrop. Runoff is medium, and the hazard of erosion is moderate. Included in mapping are areas of soils that have slopes of as much as 40 percent and small areas of Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, eroded.

This mapping unit is not suitable for clearing and range seeding by drilling because the surface layer is very cobbly and part of the unit is Rock outcrop. Rob Roy soil—capability unit VIIs–U, nonirrigated, and Upland Loam range site; Rock outcrop—capability unit VIIIs–X.

Rock Land

Rock land (RO) is a land type that consists of 60 to 80 percent Rock outcrop and 20 to 40 percent soils that are very shallow to bedrock. This land is steep to very steep. It occurs throughout the survey area, but is most extensive in the Mineral Mountain Range. Included in mapping are a few small areas of deeper soils.

In places there is some vegetation. At a higher elevation there is some conifer timber, oregongrape, mountainmahogany, Gambel oak, pinyon, and juniper. At a lower elevation the native vegetation is big sagebrush, yellowbrush, Indian ricegrass, squirreltail, and some annual weeds. The vegetation is sparse and has little value for grazing.

This land type is suitable for esthetic purposes, watershed catchment, and wildlife habitat. Capability unit VIIIs–X.

Sheeprock Series

The Sheeprock series consists of deep, gently sloping to steep, somewhat excessively drained soils on hills. These soils formed in alluvium derived principally from acid igneous material. Sheeprock soils are on the lower rolling hills in the southern and eastern parts of the Mineral Mountain Range. They are associated with Cokel and Ushar soils. Elevation ranges from 6,200 to 6,800 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is about 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, pinyon, bitterbrush, big sagebrush, desert mallow, phlox, Indian ricegrass, and squirreltail.

In a representative profile the upper 3 inches is light brownish-gray, loose gravelly coarse sand. The next layer is stratified, light brownish-gray, light-gray, and pale-brown very gravelly coarse sand, very gravelly coarse sandy loam, and coarse sandy loam.

The available water capacity is 3 to 4 inches in a 5-foot profile, and the water supplying capacity is 5 to 8 inches. Permeability is rapid. Roots can penetrate to a depth of more than 5 feet.

These soils are used for watershed catchment, range, woodland, and wildlife habitat. They are difficult to clear and range seed successfully because they have low water capacity and the erosion hazard is high. Vegetation can be improved by good range management.

Representative profile of Sheeprock gravelly coarse sand, 10 to 30 percent slopes, in an area of Sheeprock-Cokel complex, 3 to 30 percent slopes, 4 miles west and 2.5 miles north of Manderfield, 0.2 mile north of the southwest corner of sec. 1, T. 28 S., R. 8 W.

C1—0 to 3 inches, light brownish-gray (10YR 6/2) gravelly coarse sand, dark grayish brown (10YR 4/2) when moist; single grained; loose, nonsticky and nonplastic; few fine roots; moderately calcareous; moderately alkaline (pH 8.2); abrupt, smooth boundary.

C2—3 to 7 inches, light brownish-gray (10YR 6/2) very gravelly coarse sandy loam, dark grayish brown (10YR 4/2) when moist; weak, fine, granular structure; slightly hard, friable, nonsticky and nonplastic; few fine, few coarse, and common medium roots; slightly calcareous in most places, but strongly calcareous in pockets; moderately alkaline (pH 8.2); clear, wavy boundary.

C3—7 to 40 inches, light brownish-gray (10YR 6/2) very gravelly coarse sand, dark grayish brown (10YR 4/2) when moist; single grained; loose, nonsticky and nonplastic; few coarse and common fine and medium roots; slightly calcareous in most places, but strongly calcareous in pockets; moderately alkaline (pH 8.2); gradual, broken boundary.

C4—40 to 49 inches, light-gray (10YR 7/2) coarse sandy loam, brown (10YR 5/3) when moist; massive; weakly cemented with lime; nonsticky and nonplastic; few fine and medium roots; few, medium, and common, fine, tubular pores; strongly calcareous; strongly alkaline (pH 8.6); gradual, wavy boundary.

C5—49 to 68 inches, pale-brown (10YR 6/3) very gravelly coarse sand, brown (10YR 4/3) when moist; single grained; loose, nonsticky and nonplastic; few fine and medium roots; noncalcareous but strongly calcareous in pockets; moderately alkaline (pH 8.2).

These soils lack definite horizons. The soil profile has color hue of 7.5YR or 10YR. Texture is dominantly gravelly coarse sand or loamy coarse sand, but there are strata of coarse sandy loam that, in places, contain gravel. The gravel is mostly fine and averages 50 percent or more by volume.

Sheeprock coarse sandy loam, 2 to 6 percent slopes (SCC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is less than 20 percent gravel. There are a few gullies. Runoff is medium, and the hazard of erosion is moderate to high.

This mapping unit is used for range, watershed catchment, and wildlife habitat. It is not suited to clearing and range seeding because it has low water capacity and the erosion hazard is high. Capability unit VIIs–U, nonirrigated; Upland Sand (Juniper-Pinyon) range site.

Sheeprock gravelly coarse sandy loam, 10 to 25 percent slopes (SDF).—This soil is moderately steep to steep and occurs on hills. It has a profile similar to the one described as representative of the series, but the surface layer is gravelly coarse sandy loam. Runoff is medium to rapid, and the hazard of erosion is high.

This mapping unit is used for range, watershed catchment, and wildlife habitat. It is not suitable for clearing and range seeding because it has low water capacity and the erosion hazard is high. Capability unit VIIs–U, nonirrigated; Upland Sand (Juniper-Pinyon) range site.

Sheeprock-Cokel complex, 3 to 30 percent slopes (SEF).—This mapping unit is 60 percent Sheeprock gravelly coarse sand, 10 to 30 percent slopes, and 40 percent Cokel cobbly coarse sandy loam, 3 to 20 percent slopes. The Sheeprock soil occurs on the side slopes of hills. The Cokel soil occurs mainly on the ridgetop.

These soils have the profiles described as representative of the Sheeprock and Cokel series. Runoff is medium to rapid, and the hazard of erosion is high. Included in mapping are small areas of a soil that has a medium textured surface layer and a moderately fine textured subsoil.

This complex is used for watershed catchment, range, wildlife, and woodland. Because of their pattern of occurrence and because they have low water capacity and the erosion hazard is high, these soils are poorly suited to clearing and range seeding. Capability unit VIIs–U, nonirrigated; Sheeprock soil—Upland Sand (Juniper-Pinyon) range site; Cokel soil—Upland Limy Loam (Juniper-Pinyon) range site.

Sheeprock-Ushar complex, 3 to 30 percent slopes (SFF).—This mapping unit is 50 percent Sheeprock gravelly coarse sand, 10 to 30 percent slopes; 30 percent Shale outcrop; and 20 percent Ushar coarse sandy loam, 3 to 25 percent slopes. The Sheeprock soil and the Shale outcrop are mainly on ridges and hillsides. The Ushar soil is mainly on the ridgetops but, in a few places, occurs on the side slopes. Runoff is rapid, and the hazard of erosion is high.

This complex is used for watershed catchment, range, and wildlife habitat. It is poorly suited to clearing and range seeding because it has low water capacity, part of the unit is Shale outcrop, and the erosion hazard is high. Sheeprock soils—capability unit VIIs–U, nonirrigated, and Upland Sand (Juniper-Pinyon) range site; Ushar soil—capability unit VIIs–U, nonirrigated, and Upland Loam (Juniper-Pinyon) range site; Shale outcrop—capability unit VIIIs–X.

Shotwell Series

The Shotwell series consists of shallow, moderately steep and steep, well-drained soils on mountains. These soils formed in residuum derived from obsidian and other glassy volcanic material. Shotwell soils are on steep mountains, northeast of Antelope Springs, in the northern part of the survey area. They are associated with Rock outcrop. Elevation ranges from 5,200 to 5,600 feet. Mean annual air temperature is 48° to 49° F, average annual precipitation is about 9 to 11 inches, and the frost-free period is 105 to 115 days. The vegetation is Indian ricegrass, squirreltail, bluebunch wheatgrass, scarlet globemallow, locoweed, big sagebrush, and yellowbrush.

In a representative profile the surface layer is light brownish-gray very cobbly loam about 3 inches thick.

The underlying layer is pale-brown, friable loam that is underlain at a depth of 12 inches by bedrock.

The available water capacity is 1.5 to 2 inches above the bedrock, and the water supplying capacity is 3 to 4 inches. Permeability is moderate. Root penetration is restricted by the bedrock.

These soils are used for range, watershed catchment, and wildlife habitat. They are not suitable for clearing and range seeding because they are shallow, have low water capacity, and are steep. Vegetation can be improved by good range management.

Representative profile of Shotwell very cobbly loam, in an area of Shotwell very rocky loam, 10 to 30 percent slopes, 5 miles north and 2 miles east of Antelope Springs, sec. 14, T. 24 S., R. 7 W.

A1—0 to 3 inches, light brownish-gray (10YR 6/2) very cobbly loam, dark grayish brown (10YR 4/2) when moist; weak, thin, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; many, fine, and few, medium, tubular pores; moderately calcareous; moderately alkaline (pH 8.3); abrupt, smooth boundary.

C—3 to 12 inches, pale-brown (10YR 6/3) loam, brown (10YR 4/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few, fine, medium, and coarse roots; few, fine, tubular pores; strongly calcareous; moderately alkaline (pH 8.3); abrupt, irregular boundary.

R—12 inches, bedrock.

The A1 horizon is 2 to 4 inches thick. Depth to bedrock is 10 to 20 inches.

Shotwell very rocky loam, 10 to 30 percent slopes (SHF).—This mapping unit is 80 percent Shotwell very cobbly loam, 10 to 30 percent slopes, and 20 percent Rock outcrop. The Shotwell soil has the profile described as representative of the Shotwell series. Runoff is rapid, and the hazard of erosion is high. Included in mapping are small areas of Hiko Peak cobbly loam, 2 to 10 percent slopes, and alluvial land. Shotwell soil—capability unit VIIs–S, nonirrigated, and Semidesert Shallow Loam (8 to 10 inch precipitation zone) range site; Rock outcrop—capability unit VIIIs–X.

Sigurd Series

The Sigurd series consists of deep, moderately sloping to moderately steep, somewhat excessively drained soils on alluvial fans. These soils formed in alluvium derived from sedimentary material. Sigurd soils are in the northwestern part of the survey area in Millard County. Elevation ranges from 5,300 to 5,600 feet. Mean annual air temperature is 48° to 49° F, average annual precipitation is about 9 to 12 inches, and the frost-free period is 105 to 115 days. The vegetation is big sagebrush, cheatgrass, shadscale, Indian ricegrass, and squirreltail.

In a representative profile the surface layer is pale-brown gravelly loam about 5 inches thick. The underlying layer is brown, friable gravelly loam and very gravelly sandy loam.

The available water capacity is 3.5 to 4 inches in a 5-foot profile, and the water supplying capacity is 5 to 8 inches. Permeability is rapid. Roots can penetrate to a depth of more than 5 feet.

These soils are used for watershed catchment, range, and wildlife habitat. They are not suitable for clearing and range seeding because they have low water capacity. Vegetation can be improved by good range management.

Representative profile of Sigurd gravelly loam, 3 to 15 percent slopes, 11¾ miles west of Cove Fort, sec. 30, T. 25 S., R. 8 W.

A1—0 to 5 inches, pale-brown (10YR 6/3) gravelly loam, dark brown (10YR 3/3) when moist; weak, thin, platy structure that parts to weak, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; common fine roots; many, fine and medium, vesicular pores; slightly calcareous; moderately alkaline (pH 8.2); clear, smooth boundary.

C1—5 to 11 inches, brown (10YR 5/3) gravelly loam, brown to dark brown (10YR 4/3) when moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; few, fine and medium, tubular pores; strongly calcareous; moderately alkaline (pH 8.4); gradual, smooth boundary.

C2—11 to 60 inches, brown (10YR 5/3) very gravelly sandy loam, brown to dark brown (10YR 4/3) when moist; single grained; loose, very friable, nonsticky and nonplastic; few fine and medium roots; interstitial pores; strongly calcareous; moderately alkaline (pH 8.4).

The A1 horizon is 3 to 6 inches thick. It has color value of 3 or 4 when moist and chroma of 2 or 3. The C horizon, at a depth between 10 and 40 inches, is gravelly loam to gravelly sandy loam over very gravelly loam or sandy loam. It has color value of 5 or 6 when dry and chroma of 3 or 4. Content of gravel ranges from 50 to 70 percent.

Sigurd gravelly loam, 3 to 15 percent slopes (SKE).—This gently sloping to moderately steep soil occurs on alluvial fans. Runoff is medium, and the hazard of erosion is moderate.

This soil is not suitable for clearing and range seeding because it has low water capacity. Capability unit VIIs–S, nonirrigated; Semidesert Stony Loam range site.

Snake Hollow Series

The Snake Hollow series consists of deep, moderately sloping to steep, somewhat excessively drained soils on alluvial fans and hills. These soils formed in alluvium derived from coarse grained acid and intermediate igneous material. Snake Hollow soils are in several locations near the Mineral Mountain Range. They are associated with Blackett, Blue Star, and Mineral Mountain soils. Elevation ranges from 6,000 to 6,800 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, pinyon, Indian ricegrass, squirreltail, lupine, big sagebrush, snakeweed, and phlox.

In a representative profile the surface layer is grayish-brown coarse sandy loam about 4 inches thick. The subsoil is grayish-brown, brown, and light-brown coarse sandy loam to light sandy clay loam about 24 inches thick. The substratum is light-brown or brown coarse sandy loam or fine gravel and sand.

The available water capacity is 4 to 6 inches, and the water supplying capacity is 6 to 9 inches. Permeability is moderately rapid. Roots can penetrate to a depth of 5 feet or more.

These soils are used for watershed catchment, range, and wildlife habitat, and have limited use as woodland. They are suitable for clearing, brush management, and range seeding where such practices are needed.

Representative profile of Snake Hollow coarse sandy loam, 3 to 10 percent slopes, eroded, 7 miles west and ¾ mile south of Manderfield, ¼ mile south of the northeast corner of sec. 29, T. 28 S., R. 8 W.

A1—0 to 4 inches, grayish-brown (10YR 5/2) coarse sandy loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft, friable, nonsticky and slightly plastic; many fine and few medium and coarse roots; few, fine, tubular pores; moderately alkaline (pH 8.2); abrupt, smooth boundary.

B1—4 to 9 inches, grayish-brown (10YR 4/2) coarse sandy loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; soft, friable, nonsticky and slightly plastic; many fine and few medium and coarse roots; few, fine, tubular pores; thin, patchy clay films; moderately alkaline (pH 8.2); clear, smooth boundary.

B21—9 to 12 inches, brown (10YR 5/3) coarse sandy loam, dark brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; hard, friable, slightly sticky and plastic; many fine and few medium and coarse roots; few, fine, tubular pores; thin, patchy clay films; moderately alkaline (pH 8.2); clear, smooth boundary.

B22—12 to 21 inches, brown (7.5YR 5/4) coarse sandy loam, dark brown (10YR 4/3) when moist; weak, medium, subangular blocky structure; very hard, firm, slightly sticky and plastic; common fine, medium, and coarse roots; common, fine, tubular pores; thin, patchy clay films; moderately alkaline (pH 8.1); gradual, wavy boundary.

B3—21 to 27 inches, light-brown (7.5YR 6/4) coarse sandy loam, brown (10YR 4/3) when moist; weak, medium, subangular blocky structure that parts to weak, fine, blocky; very hard, firm, slightly sticky and plastic; few fine roots; few, fine and medium, tubular pores; thin, patchy clay films in some pores; slightly calcareous, lime in veins and mycelia; strongly alkaline (pH 8.5); irregular, wavy boundary.

C1—27 to 35 inches, brown (7.5YR 5/4) coarse sandy loam, brown to dark brown (10YR 4/3) when moist; massive; very hard, very friable, nonsticky and nonplastic; few fine roots; slightly calcareous; strongly alkaline (pH 8.5); irregular, wavy boundary.

C2—35 to 66 inches, light-brown (7.5YR 6/4) fine gravel and sand, brown (7.5YR 5/4) when moist; single grained; loose, nonsticky and nonplastic; few fine roots; noncalcareous, except for lime coating on the bottom of some pebbles; moderately alkaline (pH 8.3).

The A1 horizon is 0 to 8 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 2 or 3. The B2 horizon is coarse sandy loam to sandy clay loam. It has color value of 4 to 6 when dry and 3 or 4 when moist and chroma of 2 through 4.

Snake Hollow coarse sandy loam, 3 to 10 percent slopes (SLD).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only 6 to 8 inches thick because the soil is slightly eroded. Runoff is medium, and the hazard of erosion is moderate. Included in mapping are small areas of Haybourne coarse sandy loam, 1 to 10 percent slopes.

This mapping unit is used entirely for watershed catchment, range, and wildlife habitat. It is suitable for clearing, brush management, and range seeding where such practices are needed. Capability unit VIe–U, nonirrigated; Upland Gravelly Loam range site.

Snake Hollow coarse sandy loam, 3 to 10 percent slopes, eroded (SLD2).—This gently sloping to sloping soil occurs on alluvial fans. It has the profile described as representative of the series. It is moderately eroded. Runoff is medium, and the hazard of erosion is moderate.

This mapping unit is used for range, watershed catchment, wildlife habitat, and woodland. The vegetation is dominantly juniper, but part of the area has been cleared and successfully seeded to grass. Capability unit VIe–U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Snake Hollow-Blackett association, 3 to 20 percent slopes, severely eroded (SNE3.)—This mapping unit is about 60 percent Snake Hollow coarse sandy loam, 3 to 20 percent slopes, severely eroded, and 40 percent Blackett coarse sandy loam, 3 to 20 percent slopes. There is no pattern of occurrence for these soils.

The Snake Hollow soil has a profile similar to the one described as representative of the Snake Hollow series, but the surface layer is 0 to only 2 inches thick because the soil is severely eroded. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

These soils are used for watershed catchment, range, wildlife habitat, and for woodland. This association has a thick stand of juniper and pinyon and little understory vegetation, which helps control erosion. Clearing and seeding to grass helps to control erosion. Capability unit VIe–U, nonirrigated; Snake Hollow soil—Upland Stony Loam (Juniper-Pinyon) range site; Blackett soil—Upland Limy Loam (Juniper-Pinyon) range site.

Snake Hollow-Blue Star association, 3 to 10 percent slopes (SOD).—This mapping unit is about 60 percent Snake Hollow coarse sandy loam, 3 to 10 percent slopes, eroded, and 40 percent Blue Star coarse sandy loam, 3 to 10 percent slopes. There is no pattern of occurrence for these soils. The Snake Hollow soil has the profile described as representative of the Snake Hollow series. The Blue Star soil has a profile similar to the one described as representative of the Blue Star series, but it lacks a cobbly surface layer and is coarse sandy loam. Runoff is medium, and the hazard of erosion is slight. Included in mapping are small areas of Blackett coarse sandy loam, 3 to 20 percent slopes.

This mapping unit is used for watershed catchment, range, woodland, and wildlife habitat. It is suitable for clearing and range seeding where such practices are needed. Capability unit VIe-U, nonirrigated; Upland Stony Loam (Juniper-Pinyon) range site.

Snake Hollow Variant

The Snake Hollow variant consists of moderately deep, moderately steep and steep, well-drained soils on

mountains. These soils formed in residuum weathered from quartzite and sandstone material. Snake Hollow variant soils occur only in the foothills in the northeast corner of the survey area. They are associated with Rock outcrop. Elevation ranges from 5,400 to 6,000 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, big sagebrush, and bluebunch wheatgrass.

In a representative profile the surface layer is grayish-brown and dark grayish-brown very cherty loam and very cherty sandy clay loam about 10 inches thick. The subsoil is brown, firm very cherty sandy clay loam and pinkish-gray very cherty clay loam underlain by fractured bedrock at a depth of about 30 inches.

The available water capacity is 2.5 to 3 inches above the bedrock, and the water supplying capacity is 5 to 8 inches. Permeability is moderate. The growth of roots is restricted by the bedrock.

These soils are used for watershed catchment, range, and wildlife habitat and have limited use as woodland. They are not suitable for clearing and range seeding because the subsoil is very cherty and part of the unit is Rock outcrop. Vegetation can be improved by using good range management and, where needed, brush management.

Representative profile of Snake Hollow very cherty loam, gravelly subsoil variant, in an area of Snake Hollow very rocky loam, gravelly subsoil variant, 10 to 30 percent slopes, eroded, 2½ miles east and 11 miles north of Cove Fort, ½ mile west from the northeast corner of sec. 4, T. 24 S., R. 6 W.

A11—0 to 2 inches, grayish-brown (10YR 5/2) very cherty loam, very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; soft, friable, slightly sticky and slightly plastic; many fine roots; few, fine, tubular pores; mildly alkaline (pH 7.6); abrupt, smooth boundary.

A12—2 to 10 inches, dark grayish-brown (10YR 4/2) very cherty light sandy clay loam, dark brown (7.5YR 3/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; few, fine, tubular pores; mildly alkaline (pH 7.6); gradual, wavy boundary.

B2t—10 to 19 inches, brown (7.5YR 5/3) very cherty heavy sandy clay loam, brown to dark brown (7.5YR 4/4) when moist; moderate, medium, subangular blocky structure that parts to moderate, fine, blocky; very hard, firm, slightly sticky and plastic; common fine and medium roots; few, fine and medium, tubular pores; thin, continuous clay films; mildly alkaline (pH 7.6); gradual, wavy boundary.

B3t—19 to 30 inches, pinkish-gray (7.5YR 6/2) very cherty clay loam, reddish brown (5YR 4/3) when moist; moderate, medium, subangular blocky structure that parts to moderate, fine, blocky; hard, firm, slightly sticky and plastic; few, fine, medium, and coarse roots; many, fine, and few, medium, tubular pores; moderate, patchy clay films; mildly alkaline (pH 7.6).

R—30 inches, fractured bedrock.

The A1 horizon is 7 to 12 inches thick and is 50 to 70 percent chert. It has color hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon is sandy clay loam to clay loam that is 60 to 90 percent chert. The amount of chert increases with increasing depth. It has color hue of 7.5YR or 5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 3 or 4. Depth to bedrock ranges from 20 to 36 inches.

Snake Hollow very rocky loam, gravelly subsoil variant, 10 to 30 percent slopes (SRF).—This mapping unit is 80 percent Snake Hollow very cherty loam, gravelly subsoil variant, 10 to 30 percent slopes, eroded, and 20 percent Rock outcrop.

The Snake Hollow soil has the profile described as representative of the variant. Runoff is medium, and the hazard of erosion is moderate. Snake Hollow soil—capability unit VIIs–U, nonirrigated, and Upland Stony Hills (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Ushar Series

The Ushar series consists of deep, gently sloping to very steep, well-drained soils on old alluvial fans, outwash plains, and mountains. These soils formed in alluvium derived from intermediate igneous material. Ushar soils are in several places throughout the survey area. They are associated with Etta, Mill Hollow, Murdock, Mosida, Phage, and Sheeprock soils. Elevation ranges from 6,000 to 6,800 feet. Mean annual air temperature is 46° to 48° F, average annual precipitation is 12 to 14 inches, and the frost-free period is 100 to 108 days. The vegetation is bluebunch wheatgrass, Sandberg bluegrass, Nevada bluegrass, squirreltail, big sagebrush, and bitterbrush. In some places juniper and pinyon are dominant.

In a representative profile the surface layer is brown loam about 6 inches thick. The subsoil is brown, firm light clay loam or heavy loam about 17 inches thick. The substratum is pinkish-white or light-gray, friable, strongly calcareous loam, gravelly sandy loam, and coarse sand and gravel.

Ushar soils are slightly to severely eroded. The available water capacity is 7 to 10 inches, and the water supplying capacity is 9 to 11 inches. Permeability is moderate. Roots can penetrate to a depth of 60 inches or more.

These soils are used for range, wildlife habitat, watershed catchment, and nonirrigated crops and have limited use as woodland. They are well suited to brush management, clearing, and range seeding where such practices are needed.

Representative profile of Ushar loam, 3 to 10 percent slopes, 2.6 miles north and 0.7 mile west of Manderfield, 0.3 mile north and 0.3 mile east of the southwest corner of sec. 8, T. 28 S., R. 7 W.

A11—0 to 3 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; weak, very thin, platy structure; slightly hard, very friable, slightly sticky and slightly plastic; vesicular pores; mildly alkaline (pH 7.4); abrupt, smooth boundary.

A12—3 to 6 inches, brown (10YR 5/3) loam, dark brown (10YR 3/3) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and plastic; common fine and medium roots; few, fine, tubular pores; mildly alkaline (pH 7.6); clear, smooth boundary.

B1—6 to 9 inches, brown (10YR 5/3), light clay loam, brown (10YR 3/3) when moist; moderate, medium, subangular blocky structure that parts to moderate, fine, subangular blocky; hard, firm, slightly sticky and plastic; common fine and medium roots; few, fine, tubular pores; mildly alkaline (pH 7.6); clear, smooth boundary.

B21—9 to 20 inches, brown (10YR 5/3), light clay loam, dark yellowish brown (10YR 3/4) when moist; moderate, medium, angular blocky structure that parts to moderate, fine, angular blocky; very hard, firm, slightly sticky and plastic; many fine and medium roots; few, fine, tubular pores; moderately alkaline (pH 8.0); abrupt, smooth boundary.

B22ca—20 to 23 inches, pale-brown (10YR 6/3), light clay loam, dark brown (10YR 4/3) when moist; moderate, medium, angular blocky structure that parts to moderate, fine, angular blocky; very hard, firm, slightly sticky and plastic; few fine roots; few, fine, tubular pores; moderately calcareous; moderately alkaline (pH 8.3); clear, smooth boundary.

C1ca—23 to 31 inches, pink (7.5YR 8/4), loam, light brown (7.5YR 6/4) when moist; massive; very hard, friable, nonsticky and slightly plastic; few fine roots; few, fine, tubular pores; very strongly calcareous; strongly alkaline (pH 8.6); gradual, wavy boundary.

C2ca—31 to 51 inches, pinkish-white (7.5YR 8/2) gravelly sandy loam, pinkish gray (7.5YR 6/2) when moist; single grained; hard, friable, nonsticky and slightly plastic; few fine roots; very strongly calcareous; moderately alkaline (pH 8.5); gradual, wavy boundary.

C3—51 to 60 inches, light-gray (10YR 7/2) coarse sand and gravel, light brownish gray (10YR 6/6) when moist; single grained; loose, nonsticky and nonplastic; slightly calcareous; moderately alkaline (pH 8.3).

The A1 horizon is 2 to 11 inches thick. It has color hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. The B2 horizon ranges from heavy loam to clay loam but is commonly light clay loam. It has color hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 when moist, and chroma of 2 or 3 when moist and 3 or 4 when dry. The A and B horizons combined are 12 to 24 inches thick. The Cca horizon is strongly calcareous to very strongly calcareous loam and gravelly sandy loam. The C horizon is coarse sand and gravel or very gravelly sandy loam.

Ushar sandy loam, 3 to 10 percent slopes, eroded (UAD2).—This soil has a profile similar to the one described as representative of the series but the surface layer is sandy loam and only 3 to 5 inches thick. This soil is moderately eroded. Runoff is medium, and the hazard of erosion is moderate.

Included in mapping are small areas of Mosida loam, 1 to 6 percent slopes, eroded, and Phage cobbly loam, 3 to 30 percent slopes, eroded. In mapped areas near the east side of the Mineral Mountain Range, the surface layer is 10 to 15 percent cobbles.

This soil is used mainly for range, wildlife habitat, and watershed catchment. It is suitable for clearing, brush management, and range seeding where such practices are needed. It is also suited to nonirrigated crops. Capability unit IVe–UZ, nonirrigated; Upland Loam range site.

Ushar loam, 1 to 6 percent slopes, severely eroded (UHC3).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 2 inches thick, and in places the entire original surface layer has eroded away. Runoff is rapid, and the hazard of erosion is high.

This mapping unit has limited use for range, watershed catchment, woodland, and wildlife habitat. The vegetation is a thick stand of juniper. Because the juniper makes up a closed stand, there is little understory vegetation to control erosion. Clearing and seeding range to grass will control erosion. Capability unit VIe–U, nonirrigated; Upland Loam (Juniper-Pinyon) range site.

Ushar loam, 3 to 10 percent slopes (UHD).—This gently sloping to gently rolling soil occurs on old alluvial fans, outwash plains, and mountain side slopes. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate.

This soil is used mainly for watershed catchment, wildlife habitat, range, and nonirrigated crops, but one area, near Cove Fort, is used for irrigated crops. This mapping unit is well suited to clearing, brush management, and seeding, where such practices are needed. Capability unit IVe–UZ, nonirrigated, and IIIe–26, irrigated; Upland Loam range site.

Ushar loam, 3 to 10 percent slopes, eroded (UHD2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only 2 to 5 inches thick. Juniper and pinyon are the dominant vegetation. Runoff is medium to rapid, and the hazard of erosion is moderate to high. Included in mapping are small areas of Manderfield loam and cobbly loam, 1 to 6 percent slopes.

This soil is used for watershed catchment, range, woodland, and wildlife habitat, but some small areas in Pine Creek are used for nonirrigated crops. Where needed, clearing and seeding to grass help control erosion. Capability unit IVe–UZ, nonirrigated; Upland Loam (Juniper-Pinyon) range site.

Ushar cobbly loam, 3 to 30 percent slopes, eroded (ULF2).—This soil is gently sloping to steep and occurs on old alluvial fans and mountain side slopes. It has a profile similar to the one described as representative of the series, but the surface layer is cobbly. This soil is moderately eroded. Runoff is medium, and the hazard of erosion is moderate to high.

This soil is used for range, watershed catchment, wildlife habitat, and to a limited extent, woodland. The dominant vegetation is juniper and pinyon. This soil is suitable for clearing and range seeding where such practices are needed, but because the surface layer is cobbly there is some limitation for range seeding with a drill. Vegetation can be improved by good range management. Capability unit VIe–U, nonirrigated; Upland Loam (Juniper-Pinyon) range site.

Ushar rocky loam, 5 to 30 percent slopes, eroded (UMF2).—This mapping unit is 95 percent Ushar very cobbly loam, 5 to 30 percent slopes, eroded, and 5 percent Rock outcrop. This Ushar soil is sloping to steep and is on alluvial fans and mountains.

This soil has a profile similar to the one described as representative of the series, but the surface layer is very cobbly. This soil is moderately eroded. Runoff is medium, and the hazard of erosion is moderate. Included in mapping are small areas of Clegg cobbly loam, 6 to 30 percent slopes, and Flowell cobbly loam, 6 to 30 percent slopes.

This mapping unit is used for range, watershed catchment, wildlife habitat, and woodland. It is not suitable for clearing and range seeding with drilling equipment because the surface layer is very cobbly. Vegetation can be improved by good range management. Ushar soil—capability unit VIIs–U, nonirrigated, and Upland Loam (Juniper-Pinyon) range site; Rock outcrop—capability unit VIIIs–X.

Ushar-Etta association, 3 to 10 percent slopes (UND).—This mapping unit is 55 percent Ushar loam, 2 to 10 percent slopes, and 35 percent Etta loam. These soils have no definite pattern of occurrence.

Runoff is medium, and the hazard of erosion is moderate. Included in mapping are small areas of Red Butte very cobbly loam, 3 to 30 percent slopes, eroded; Flowell loam, 3 to 6 percent slopes, eroded; and Rock outcrop.

This area is used for watershed catchment, wildlife habitat, and range. Most of the acreage has been cleared and range seeded. Capability unit IVe–UZ, nonirrigated; Upland Loam range site.

Ushar-Mill Hollow association, 1 to 10 percent slopes, eroded (UOD2).—This mapping unit is about 60 percent Ushar loam, 3 to 10 percent slopes, eroded, and 40 percent Mill Hollow loam, 1 to 10 percent slopes. The Ushar soil is on ridges, and the Mill Hollow soil is in alluvial valleys.

The Mill Hollow soil has a profile similar to the one described as representative of the Mill Hollow series, but the surface layer is less than 10 percent cobbles. The Ushar soil is moderately eroded. On the soils in this association, runoff is medium and the hazard of erosion is moderate. Included in mapping are small areas of Mosida loam, 1 to 3 percent slopes, and Pharo cobbly loam, 3 to 30 percent slopes, eroded.

These soils are used mainly for watershed catchment, range, wildlife habitat, and woodland, but they are also used for nonirrigated crops. They are suitable for clearing and range seeding where such practices are needed. Capability unit IVe–UZ, nonirrigated; Ushar soil—Upland Loam (Juniper-Pinyon) range site, Mill Hollow soil—Upland Limy Loam range site.

Ushar-Mill Hollow association, 10 to 30 percent slopes, eroded (UOF2).—This mapping unit is 50 percent Ushar very cobbly loam, 10 to 30 percent slopes, eroded; 30 percent Mill Hollow very cobbly loam, 10 to 30 percent slopes; 15 percent Rock outcrop; and 5 percent Pharo very cobbly loam, 3 to 30 percent slopes. There is no definite pattern of occurrence for these soils.

The Ushar soil has a profile similar to the one described as representative of the Ushar series, but the surface layer is very cobbly. This soil is moderately eroded. On the soils in this association, runoff is medium and the hazard of erosion is moderate. Included in mapping are small areas of soils that are free of cobbles.

This acreage is used for watershed catchment, wildlife habitat, and range, and has limited use as woodland. It is not suitable for seeding with drilling equipment because the surface layer is very cobbly. Vegetation can be improved by using good range management. Ushar soils and Mill Hollow soils—capability unit VIIs–U, nonirrigated; Ushar soil—Upland Loam (Juniper-Pinyon) range site, and Mill Hollow soil—Upland Limy Loam range site; Rock outcrop—capability unit VIIIs–X.

Ushar-Mosida association, 3 to 30 percent slopes (URF).—This mapping unit is 80 percent Ushar very cobbly loam, 5 to 30 percent slopes, and 20 percent Mosida loam, 3 to 6 percent slopes.

The Ushar soil occurs on the ridges and hills and the Mosida soil is in small areas on bottoms of small valleys. The Ushar soil has a profile similar to the one described as representative of the Ushar series, but the surface layer is very cobbly. Runoff is medium, and the hazard of erosion is moderate.

These soils are used for watershed catchment, range, and wildlife habitat. The Ushar soil is not suitable for clearing and range seeding because the surface layer is very cobbly. The Mosida soil is suitable for clearing and range seeding. Ushar soil—capability unit VIIs–U, nonirrigated, and Upland Loam (Juniper-Pinyon) range site; Mosida soil—capability unit IVe–UZ, nonirrigated, and Upland Loam range site.

Ushar-Murdock association, 3 to 25 percent slopes (USF).—This mapping unit is 60 percent Ushar coarse sandy loam, 3 to 25 percent slopes, and 40 percent Murdock coarse sandy loam, 3 to 6 percent slopes. The Ushar soil is on ridges and hills, and the Murdock soil is in the more level areas.

The Ushar soil has a profile similar to the one described as representative of the Ushar series, but the surface layer is coarse sandy loam. The Murdock soil has a profile similar to the one described as representative of the Murdock series, but the surface layer is sandy loam. Runoff is medium, and the hazard of erosion is moderate.

These soils are used for watershed catchment, range, wildlife habitat, and woodland. This association has been cleared and successfully seeded to grass. Capability unit VIe–U, nonirrigated; Ushar soil—Upland Loam (Juniper-Pinyon) range site; Murdock soil—Upland Shallow Hardpan (Juniper-Pinyon) range site.

Ushar-Phage association, 3 to 30 percent slopes, eroded (UTF2).—This mapping unit is 60 percent Ushar cobbly loam, 3 to 30 percent slopes, eroded, and 40 percent Phage cobbly loam, 3 to 30 percent slopes, eroded. The Phage soil occurs mainly on the side slopes and ridges, but there is no pattern of occurrence.

The Ushar and Phage soils have profiles similar to the ones described as representative of their series, but the surface layer is cobbly. Included in mapping are small areas of Deer Creek cobbly loam, 3 to 30 percent slopes, eroded; Red Butte very cobbly loam, 3 to 30 percent slopes, eroded; and Ushar loam, 3 to 10 percent slopes, eroded.

This Ushar soil is moderately eroded. On the soils of this association, runoff is medium and the hazard of erosion is moderate.

This association is used for watershed catchment, range, wildlife habitat, and woodland. The soils have some limitations because the surface layer is cobbly. They are suitable for clearing and range seeding

where such practices are needed. Capability unit VIe–U, nonirrigated; Ushar soil—Upland Loam (Juniper-Pinyon) range site; Phage soil—Upland Stony Loam (Juniper-Pinyon) range site.

Ushar-Phage association, 30 to 70 percent slopes, eroded (UTG2).—This mapping unit is 60 percent Ushar gravelly loam, 30 to 70 percent slopes, eroded, and 40 percent Phage gravelly loam, 30 to 70 percent slopes, eroded. These soils have no definite pattern of occurrence.

The Ushar and Phage soils have profiles similar to the ones described as representative of the Ushar and Phage series, but the surface layer is gravelly. Included in mapping are small areas of soil that has slopes of less than 30 percent and small areas that have a cobbly surface.

The Ushar soil is moderately eroded. On the soils in this association, runoff is rapid and the hazard of erosion is high.

These soils are used for watershed catchment, range, wildlife habitat, and woodland. They are not suitable for clearing and range seeding because they are very steep. Vegetation can be improved by good range management. Capability unit VIIe–U, nonirrigated; Ushar soil—Upland Loam (Juniper-Pinyon) range site; Phage soil—Upland Stony Loam (Juniper-Pinyon) range site.

Ushar Variant

The Ushar variant consists of deep, gently sloping to moderately sloping, well-drained soils on dissected outwash plains and old alluvial fans. These soils formed in alluvium derived from mixed igneous material and quartzite. They are predominantly on the benchland north of the North Creek field. Elevation ranges from 6,000 to 6,500 feet. Mean annual air temperature is 45° to 48° F, average annual precipitation is 14 to 17 inches, and the frost-free period is 100 to 108 days. The vegetation is juniper, pinyon, big sagebrush, bluebunch wheatgrass, and cheatgrass.

In a representative profile the surface layer is brown silt loam about 9 inches thick. The subsoil is reddish-brown, friable clay loam or gravelly clay loam to a depth of 60 inches or more. A horizon of weak lime accumulation occurs in the lower part of the subsoil.

Permeability is moderately slow. Roots can penetrate to a depth of 5 feet or more. The available water capacity is 8.5 to 11 inches in a 5-foot profile, and the water supplying capacity is 10 to 14 inches.

These soils are used for watershed catchment, wildlife habitat, range, and irrigated crops and have limited use as woodland. Range seedings have been successful. Irrigated crops include alfalfa hay and small grain.

Representative profile of Ushar silt loam, thick solum variant, 1 to 3 percent slopes, in an area of the Flowell association, 1 to 3 percent slopes, 3.5 miles north of Beaver Post Office on U.S. Highway 91, then 2.8 miles east and 175 miles northeast; sec. 30 T. 28 S., R. 6 W.

Ap—0 to 3 inches, brown (7.5YR 5/2) silt loam, dark brown (7.5YR 3/2) when moist; weak, thick, platy structure that parts to moderate, fine, granular; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; few fine pores; neutral (pH 7.1); clear, smooth boundary.

A1—3 to 9 inches, brown (7.5YR 5/2) silt loam, dark brown (7.5YR 3/2) when moist; weak, subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and medium roots; few fine pores; mildly alkaline (pH 7.4); clear, smooth boundary.

B21t—9 to 21 inches, reddish-brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) when moist; moderately coarse, subangular blocky structure that parts to fine, blocky; hard, friable, sticky and plastic; common medium roots; few fine pores; thin, patchy clay films; mildly alkaline (pH 7.4); clear, wavy boundary.

B22t—21 to 27 inches, reddish-brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/4) when moist; weak, coarse, subangular blocky structure that parts to moderate, medium and fine, blocky; hard, friable, sticky and plastic; few medium roots; few fine pores; thin, patchy clay films; mildly alkaline (pH 7.5); clear, wavy boundary.

B23t—27 to 34 inches, reddish-brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/4) when moist; weak, coarse, subangular blocky structure that parts to moderate, medium and fine, blocky; hard, friable, slightly sticky and plastic; few medium roots; few fine pores; moderate, continuous clay films; neutral (pH 7.0); clear, wavy boundary.

B24t—34 to 42 inches, reddish-brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) when moist; moderate, coarse to medium, angular blocky structure; hard, firm, sticky and plastic; few medium roots; few fine pores; thin, patchy clay films; noncalcareous; some fine veins and coatings of lime on a few pebbles; mildly alkaline (pH 7.7); clear, wavy boundary.

B25t—42 to 60 inches, reddish-brown (5YR 5/4) gravelly clay loam, reddish brown (5YR 4/4) when moist; moderate, coarse, blocky structure; hard, firm, sticky and plastic; few medium roots; few fine pores; thin, patchy clay films; noncalcareous soil mass, but some fine veins and coatings of lime on a few pebbles; mildly alkaline (pH 7.7); clear, wavy boundary.

The A1 horizon is 3 to 12 inches thick. It has color value of 4 or 5 when dry and 2 or 3 when moist and chroma of 2 or 3. The B2t horizon may be gravelly clay loam below a depth of 15 inches but is predominantly clay loam or heavy loam. It has color hue of 5YR or 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 3 or 4. It has weak accumulations of lime in the lower part. The combined A and B horizons are 40 inches thick or more.

These soils are mapped only in association with Flowell soils.

Wallsburg Series

The Wallsburg series consists of shallow, moderately sloping to very steep, well-drained soils on ridges and mountains. These soils formed in residuum weathered from intermediate igneous material and quartzite. Wallsburg soils occur in the Mineral Mountain Range, generally near the summits. They are associated with Maple Mountain and Yardley soils and the Flowell variant. Elevation ranges from 6,800 to 8,000 feet. Mean annual air temperature is 39° to 40° F, average annual precipitation is 18 to 20 inches, and the frost-free period is 65 to 90 days. The vegetation is Gambel oak, mountainmahogany, big sagebrush, and tall native bluegrass.

In a representative profile the surface layer is grayish-brown very cobbly loam about 6 inches thick. The subsoil is brown very cobbly clay underlain by fractured bedrock at a depth of 19 inches.

Wallsburg soils are moderately eroded. The available water capacity is less than 1 inch above the bedrock, and the water supplying capacity is 4 to 7 inches. Permeability is moderate above the bedrock. Root penetration is limited by the bedrock.

These soils are used for range, wildlife habitat, and watershed catchment. They are not suitable for clearing and range seeding because they are shallow and steep. Vegetation can be improved by good range management.

Representative profile of Wallsburg very cobbly loam, 30 to 60 percent slopes, eroded, 4 miles west and 6 miles north of Manderfield, 0.4 mile north and 0.1 mile east of the southwest corner of sec. 24, T. 27 S., R. 8 W.

A1—0 to 6 inches, grayish-brown (10YR 5/2) very cobbly loam, very dark brown (10YR 2/2) when moist; weak, fine, granular structure; slightly hard, friable, slightly sticky and plastic; common medium, many fine, and few coarse roots; few, fine, tubular pores; noncalcareous; mildly alkaline (pH 7.8); clear, smooth boundary.

B2t—6 to 19 inches, brown (7.5YR 4/2) very cobbly clay, dark brown (7.5YR 3.4/2) when moist; weak, very fine, subangular blocky structure; hard, very firm, sticky and plastic; common medium and fine roots; interstitial pores; thick, continuous clay films on faces of coarse fragments; 80 percent stone; mildly alkaline (pH 7.8); abrupt, irregular boundary.

R—19 inches, fractured bedrock.

The A1 horizon is 5 to 11 inches thick. It has color hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3. The B2t horizon is extremely stony clay or clay loam. It has color hue of 10YR or 5YR, value of 4 or 5 when dry and 2 through 4 when moist, and chroma of 2 through 4. Bedrock is fractured and occurs 10 to 20 inches from the surface.

Wallsburg very cobbly loam, 30 to 60 percent slopes, eroded (WBG2).—This soil has the profile described as representative of the series. Runoff is very rapid, and the hazard of erosion is high.

This soil is used for range, wildlife habitat, and watershed catchment. It is not suited to clearing or range seeding because it is very cobbly, shallow, and very steep. Capability unit VIIs–M, nonirrigated; Mountain Shallow Loam range site.

Wallsburg association, 30 to 60 percent slopes, eroded (WCG2).—This mapping unit is about 60 percent Wallsburg very cobbly loam, 30 to 60 percent slopes, eroded, and 40 percent Flowell cobbly loam, cold variant, 30 to 60 percent slopes, eroded. The Wallsburg soil is on the ridges and side slopes. The Flowell variant soil is on the side slopes.

Runoff is rapid to very rapid, and the hazard of erosion is high.

This association is used for range, wildlife habitat, and watershed catchment. It is not suitable for clearing and range seeding because it has a very cobbly surface and is shallow and very steep. Wallsburg soil—Capability unit VIIs–M, nonirrigated, and Mountain Shallow Loam range site; Flowell variant soil—capability unit VIIe–M, nonirrigated, and Mountain Gravelly Loam range site.

Wallsburg-Maple Mountain association, 3 to 60 percent slopes, eroded (WMG2).—This mapping unit is about 40 percent Wallsburg very cobbly loam, 3 to 30 percent slopes, eroded; 20 percent Wallsburg very cobbly loam, 30 to 60 percent slopes, eroded; and 40 percent Maple Mountain cobbly loam, 25 to 50 percent slopes. The Wallsburg soils are on ridgetops and mountain slopes near the summit. The Maple Mountain soil is on mountain slopes.

Runoff is medium to rapid, and the hazard of erosion is moderate to high.

These soils are used for range, wildlife habitat, and watershed catchment. They are not suitable for clearing and range seeding because the surface layer is very cobbly and the soil is very steep and shallow. Vegetation can be improved by good range management. Wallsburg soil—capability unit VIIs–M, nonirrigated, and Mountain Shallow Loam range site; Maple Mountain soil—capability unit VIIe–M, nonirrigated, and Mountain Loam range site.

Wet Alluvial Land

Wet alluvial land (Wt) is a land type that consists of deep, poorly drained, gravelly or cobbly soil material. It is moderately extensive along the Beaver River bottom, both east and west of Beaver City, and is subject to overflow. In places there is little or no horizon formation. In other places, the soils can be recognized but are too small in extent to be mapped. There is considerable variation within a short distance. Although the soils are gravelly or cobbly and range from loam to coarse sand, they are generally sandy loam or coarse sand. Mottles occur at various depths below 6 inches. The water table fluctuates with the flow of the Beaver River but is generally at depths between 12 and 30 inches. The native vegetation is cottonwood trees, bluegrass, big sagebrush, rabbitbrush, and sedges. It is used for pasture and wildlife habitat. Capability unit VIw–2, nonirrigated; Wet Stream Bottoms range site.

Yardley Series

The Yardley series consists of deep, gently sloping to steep, well-drained soils on alluvial fans and mountain side slopes and in mountain valleys. These soils formed in alluvium derived from acid and intermediate igneous material. Yardley soils are on the high fans on the east slopes of the Mineral Mountain Range near Shag Hollow and on the northern end of Maple Mountain. They are associated with Maple Mountain and Wallsburg soils. Elevation ranges from 6,700 to 7,000 feet. Mean annual air temperature is 39° to 40° F, average annual precipitation is 18 to 20 inches, and the frost-free period is 65 to 85 days. The vegetation is Gambel oak, big sagebrush, snowberry, serviceberry, bluebunch wheatgrass, lupine, and cheatgrass.

In a representative profile the surface layer is dark grayish-brown loam about 10 inches thick. The subsoil is light-brown and pink firm heavy clay loam about 30

inches thick. The substratum is pink, friable loam. The soil is noncalcareous throughout.

On Yardley soils the hazard of erosion is moderate. The available water capacity is 9 to 12 inches in a 5-foot profile, and the water supplying capacity is 12 to 15 inches. Permeability is slow. Roots can penetrate to a depth of more than 5 feet.

These soils are used for range, wildlife habitat, and watershed catchment. They are suitable for clearing and range seeding where such practices are needed.

Representative profile of Yardley loam, 1 to 6 percent slopes, 6.7 miles north and 7.1 miles west of Manderfield, 0.4 mile north of the southeast corner of sec. 17, T. 27 S., R. 8 W.

A1—0 to 10 inches, dark grayish-brown (10YR 4/2) loam, very dark brown (10YR 2/2) when moist; moderate, fine, granular structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium and few coarse roots; few, fine, tubular pores; mildly alkaline (pH 7.4); clear, smooth boundary.

B21t—10 to 17 inches, light-brown (7.5YR 6/3) heavy clay loam, dark brown (7.5YR 4/2) when moist; strong, medium, prismatic structure that parts to moderate, medium, angular blocky; very hard, firm, sticky and plastic; common fine and medium roots; few, fine, tubular pores; moderate, continuous clay films; mildly alkaline (pH 7.6); clear, smooth boundary.

B22t—17 to 40 inches, pink (7.5YR 7/4) heavy clay loam, dark brown (7.5YR 4/4) when moist; moderate, coarse, angular blocky structure that parts to moderately fine, angular blocky; very hard, firm, slightly sticky and slightly plastic; few fine and medium roots; few, fine, tubular pores; thin, patchy clay films; mildly alkaline (pH. 7.6); gradual, wavy boundary.

C—40 to 60 inches, pink (7.5YR 7/3) heavy loam, brown (7.5YR 4/3) when moist; weak, coarse, angular blocky structure that parts to weak, fine, angular blocky; very hard, friable, slightly sticky and plastic; few fine roots; common fine pores; mildly alkaline (pH 7.7).

The A1 horizon is 7 to 15 inches thick. It has color value of 3 to 5 when dry and 2 or 3 when moist and chroma of 2 or 3. The B2t horizon is heavy clay loam to light clay. It has color hue of 7.5YR or 10YR. The upper part of the Bt horizon has color value of 4 to 6 when dry and 3 or 4 when moist; the lower part has color value of 5 to 7 when dry and 4 or 5 when moist. Chroma is 2 through 4. The A and B horizons combined are 30 inches or more thick. Gravel or cobbles may occur in the C horizon. Bedrock can occur at a depth of 40 inches.

Yardley loam, 1 to 6 percent slopes (YAC).—This gently sloping to sloping soil occurs on alluvial fans and in mountain valleys. It has the profile described as representative of the series. Runoff is medium, and the hazard of erosion is moderate.

Included with this soil in mapping are areas of a soil that is moderately deep to bedrock and is medium textured or moderately coarse textured. Also included are small areas of soils in the swales that are similar to this Yardley soil but have a surface layer 40 to 48 inches thick.

This Yardley soil has available water capacity of 12 inches.

This mapping unit is used for range, wildlife habitat, and watershed catchment. It is well suited to clearing, brush management, and range seeding. Part of the acreage has been successfully seeded. Capability unit IVe–M, nonirrigated; Mountain Loam range site.

Yardley-Maple Mountain association, 1 to 25 percent slopes (YME).—This mapping unit is 60 percent Yardley loam, 1 to 6 percent slopes, and 40 percent Maple Mountain cobbly loam, 10 to 25 percent slopes. The Yardley soil is gently sloping to sloping and occurs on fans and in narrow mountain valleys. The Maple Mountain soil is moderately steep to steep and occurs on mountains and ridges.

Runoff is medium, and the hazard of erosion is moderate. Included in mapping are small areas of Wallsburg very cobbly loam, 3 to 30 percent slopes, and Maple Mountain cobbly loam, 25 to 50 percent slopes.

This mapping unit is used for range, wildlife habitat, and watershed catchment. It is suitable for clearing, brush management, and range seeding where such practices are needed. Yardley soil—capability unit IVe–M, nonirrigated, Maple Mountain soil—capability unit VIe–M, nonirrigated, both soils in Mountain Loam range site.

Yardley-Wallsburg association, 3 to 30 percent slopes (YWF).—This mapping unit is 55 percent Yardley loam, deep over bedrock, 3 to 30 percent slopes; 40 percent Wallsburg very cobbly loam, 3 to 30 percent slopes, eroded; and 5 percent Rock outcrop. There is no definite pattern of occurrence. The Yardley soil is on mountain side slopes.

The Yardley soil has a profile similar to the one described as representative of the Yardley series, but the surface layer is 4 to 6 inches thinner and the soil is lighter colored. Bedrock is at a depth of about 40 inches. Available water capacity is about 9 inches. On the soils in this association, runoff is medium to rapid and the hazard of erosion is moderate to high. Included in mapping are small areas of Yardley loam that has slopes of as much as 60 percent and small areas of soil similar to this Yardley soil that is 20 to 40 inches deep to bedrock.

These soils are used for range, wildlife habitat, and watershed catchment. The Yardley soil is suitable for brush management, clearing, and range seeding where such practices are needed. The Wallsburg soil is not suitable because it is shallow to bedrock. Since these soils are intermixed, range seeding would be difficult. Yardley soil—capability unit VIe–M, nonirrigated, Mountain Gravelly Loam range site; Wallsburg soil—capability unit VIIs–M, nonirrigated, Mountain Shallow Loam range site; Rock outcrop—capability unit VIIIs–X.

Use and Management of the Soils

The soils of the Beaver-Cove Fort area are used chiefly for irrigated pasture, irrigated crops, and range. In the following pages use of the soils for crops and pasture is discussed, the capability grouping used by the Soil Conservation Service is explained, and the management of soils in the survey area by capability units, both irrigated and nonirrigated, is discussed. Estimated yields of the principal crops are given. Also

discussed is management of the soils for range and wildlife. The soil properties and features that affect engineering practices are listed, mainly in tables.

Crops and Pasture

Production of forage and grain for livestock is the principal use of soils within the irrigated area. The crops are alfalfa, small grain, pasture, and corn for silage. Some management practices are beneficial to almost all the soils used for irrigated crops and pasture. These are discussed briefly in the following paragraphs.

Among the important management requirements are land leveling for efficient and uniform distribution of irrigation water, applying safe and necessary amounts of water at the proper time, draining, fertilizing, and controlling erosion.

A large part of the irrigated acreage is shallow to gravel and suitable only for a limited amount of leveling. Sprinkler irrigation on these gravelly soils is a satisfactory and often a desirable method of applying water. Both border and furrow methods are suitable for alfalfa, pasture plants, and small grain, and the furrow method is suitable for row crops. Losses of soil and water can be held to a minimum by using the proper lengths of runs and the proper amount of water in furrows and borders for the proper length of time.

The soils used for pasture and meadow hay have a fluctuating water table. The depth to the water table varies, depending on the amount of irrigation water applied to these and adjacent soils. Inadequate supply of water in summer and cool temperatures make drainage of the wet soils economically questionable. It is beneficial to control the surface water on, and the drainage in, some of the excessively wet areas. Some of the wet soils are also affected by salts, and drainage is necessary to leach the salts from these soils.

Most of the soils in this area are well supplied with potassium, calcium, iron, and magnesium. Crops generally respond to a fertilizer high in content of nitrogen or phosphorus, or both, depending on the crop and the cropping history. Phosphate fertilizers are applied principally to legumes.

Good tilth is desirable in cultivated areas and can be maintained by fall plowing, avoiding tillage and trampling when the soils are wet, growing sod crops, and returning crop residue and barnyard manure to the soil.

Because the content of organic matter is low in many soils of the survey area, they are susceptible to the formation of traffic pans. Good tilth can be maintained and the formation of traffic pans reduced if the soils are not tilled or trampled when wet. The formation of traffic pans can also be reduced by varying the depth of tillage and reducing the number of times that tillage equipment crosses the soil.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, forest trees, or engineering.

In the capability system, the kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. These are discussed 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, 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, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife habitat.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife habitat, or water supply, or to esthetic purposes.

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 shal-

low, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife habitat, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe–2 or IIIe–25. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and an Arabic numeral or a letter specifically identifies the capability unit in the Utah system within each subclass.

In the Utah system a number or letter is used to indicate the chief kind of limitation. Numbers are used for irrigated capability units and letters for nonirrigated capability units. The number 2 after the hyphen shows that 100 to 150 days are frost free. For some capability units additional limitations are shown as follows: 3 shows an inhibiting layer or shallowness; 4, low available water capacity in gravelly or cobbly soils; 5, slow permeability; 6, low available water capacity for sandy soils; 7, salinity; and 8, saline-alkali soil.

A letter after the hyphen gives the annual rainfall. The letter M shows an annual rainfall of 16 to 24 inches; S, 8 to 12 inches; and U, 12 to 18 inches. For some capability units an additional limitation is shown by the letter Z, which indicates 12 to 14 inches of precipitation, or the number 8, which shows saline-alkali soil. For some miscellaneous land types in Class VIII, and subclass *s* or *w*, the letter X is used after the hyphen to show low available water capacity in stony or rocky material.

Management by Capability Units

In this section each capability unit in the Beaver-Cove Fort Area is described, and its use and management are briefly discussed. The units are not numbered consecutively, because not all the units in the statewide system are represented in this survey area. The names of the soil series represented are mentioned in the description of each unit, but this does not mean that all the soils in a given series are in the unit. To find the names of all the soils in any capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT IIe–2, IRRIGATED

This capability unit consists of deep, well-drained soils in the Etta series, the Hansel variant, and the Ushar variant. These soils are on alluvial fans and flood plains. They formed in alluvium derived from mixed igneous and sedimentary materials. Slopes range from 1 to 3 percent. Elevation ranges from 5,800 to 6,500 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 12 to 17 inches.

These soils have a surface layer of loam or silt loam and a subsoil of silt loam, clay loam, silty clay loam, or gravelly clay loam. Permeability is moderate to moderately slow. The available water capacity is 8.5 to 11.5 inches. Roots can penetrate to a depth of more than 5 feet. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are used for irrigated alfalfa, small grain, pasture, and corn for silage.

Furrow irrigation is suited to row crops, and border irrigation is suited to alfalfa, small grain, and pasture plants. Sprinklers also can be used satisfactorily. Where used for alfalfa, small grain, corn, and pasture plants, these soils need 4 to 5 inches of irrigation water every 20 to 25 days in periods of maximum water use.

CAPABILITY UNIT IIe–26, IRRIGATED

This capability unit consists of deep, well-drained soils of the Fruitland and Mosida series. These soils formed in alluvium derived from mixed igneous and sedimentary materials. They are on alluvial fans and flood plains. Slope ranges from 1 to 3 percent. Elevation ranges from 5,200 to 6,300 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 10 to 13 inches.

The surface layer is loam, and the subsoil is fine sandy loam, silt or loam. Permeability is moderate. About 6 to 9 inches of available water is held to a depth of 5 feet or more. Roots can penetrate to a depth of 5 feet or more. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are used for irrigated alfalfa, small grain, pasture and corn for silage.

Furrow irrigation is suited to row crops, and border irrigation is suited to alfalfa, small grain, and pasture plants. Sprinklers also can be used satisfactorily. Where used for alfalfa, small grain, corn, and pasture, these soils need 3 to 4 inches of irrigation water every 15 to 20 days in periods of maximum water use.

CAPABILITY UNIT IIw–2, IRRIGATED

This capability unit consists of deep, somewhat poorly drained soils of the Draper series and the James Canyon calcareous variant. These soils are on alluvial flood plains and river terraces. They formed in alluvium derived from mixed igneous, sedimentary, and metamorphic materials. Slopes range from 1 to 3 percent. Elevation ranges from 5,700 to 6,000 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 11 to 13 inches.

These soils have a surface layer of loam and a subsoil of loam or very fine sandy loam. Permeability is

moderate. About 7 to 10 inches of available water is held above the water table. Roots can penetrate to a depth of 5 feet or more but are restricted because the depth to a seasonal water table is commonly 30 to 40 inches. Runoff is slow, and the hazard of erosion is slight.

These soils are used mainly for irrigated pasture or meadow hay. Occasionally, in the better drained areas, alfalfa and small grain are grown. The soils are suited to alfalfa, small grain, and corn for silage if drained and irrigation water is controlled.

Furrow irrigation is suited to row crops, and border irrigation is suited to alfalfa, small grain, and pasture. Sprinklers also can be used satisfactorily. Where used for alfalfa, small grain, corn, and pasture plants, these soils need 2.5 to 3 inches of irrigation water every 12 to 15 days in periods of maximum water use.

CAPABILITY UNIT IIIe–23, IRRIGATED

This capability unit consists only of Murdock silt loam, 1 to 3 percent slopes. This is a moderately deep, well-drained soil that formed in alluvium derived from mixed igneous materials. It is on dissected terraces, plateaus, and outwash plains. Elevation ranges from 6,000 to 6,500 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 12 to 14 inches.

This soil has an underlying layer of silt loam that overlies a lime-cemented hardpan. Permeability is moderate. About 4 to 5 inches of available water is held above the hardpan. Roots can penetrate to a depth of 24 to 30 inches or down to the hardpan. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for irrigated alfalfa, small grain, pasture, and silage corn. The shallow root zone shortens the life of alfalfa.

Furrow irrigation is suited to row crops, and border irrigation is suited to alfalfa, small grain, and pasture plants. Sprinklers also can be used satisfactorily. Where used for alfalfa, small grain, corn, and pasture plants, this soil needs 2 to 2.5 inches of irrigation water every 10 to 12 days in periods of maximum water use.

CAPABILITY UNIT IIIe–25, IRRIGATED

This capability unit consists of deep, well-drained soils of the Etta variant and the Flowell series. These soils formed in alluvium derived from mixed igneous and metamorphic material. They are on alluvial fans and terraces. Slope ranges from 1 to 3 percent. Elevation ranges from 5,900 to 6,800 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 12 to 14 inches.

These soils have a surface layer of loam or clay and a subsoil of clay loam or clay. Permeability is slow. About 9 to 12 inches of available water is held. Roots can penetrate to a depth of 5 feet or more. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are used for irrigated alfalfa, small grasses, pasture plants, and corn for silage.

Furrow irrigation is suited to row crops, and border irrigation is suited to alfalfa, small grain, and pasture plants. Sprinklers can be used satisfactorily on the Flowell soil. Where used for alfalfa, small grain, corn, and pasture, these soils need 4 to 5 inches of irrigation water every 20 to 25 days in periods of maximum water use.

CAPABILITY UNIT IIIe–26, IRRIGATED

This capability unit consists of deep, well-drained soils of the Fruitland, Mosida, and Ushar series. These soils formed in mixed igneous and sedimentary material. They are on alluvial fans, outwash plains, and flood plains. Slope ranges from 2 to 10 percent. Elevation ranges from 5,200 to 6,800 feet. The frost-free period is 100 to 115 days, and the average annual precipitation is 10 to 14 inches.

These soils have a surface layer of loam and a subsoil of fine sandy loam, loam, or clay loam. Permeability is moderate. About 7 to 10 inches of available water is held. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are used for irrigated alfalfa, small grain, pasture plants, and, occasionally corn for silage.

Furrow irrigation is suited to alfalfa, small grain, corn, and pasture plants. Sprinklers can be used satisfactorily. Where used for alfalfa, small grain, corn, and pasture plants, these soils need about 3 to 4 inches of irrigation water every 15 to 20 days in periods of maximum water use.

CAPABILITY UNIT IIIs–24, IRRIGATED

This capability unit consists of deep, well-drained and somewhat excessively drained soils of the Manderfield and Pharo series. These soils formed in the alluvium derived from mixed sedimentary and metamorphic materials. They are on alluvial fans, outwash plains, and stream terraces. Slope ranges from 1 to 6 percent. Elevation ranges from 5,800 to 6,400 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 12 to 14 inches.

These soils have a surface layer of loam and a subsoil of gravelly loam or clay loam. The substratum is gravelly silt loam or very gravelly loamy sand. Permeability is moderate to moderately rapid. About 3 to 5 inches of available water is held. Roots can penetrate to a depth of 5 feet or more. Runoff is slow, and the hazard of erosion is slight to moderate.

These soils are used for irrigated alfalfa, small grain, pasture plants, and corn for silage.

Furrow irrigation is suited to row crops, and border irrigation is suited to alfalfa, small grain, and pasture plants. Sprinklers can be used satisfactorily. Where used for alfalfa, small grain, corn, and pasture plants, these soils need about 2 to 3 inches of irrigation water every 10 to 12 days in periods of maximum water use.

CAPABILITY UNIT IVe–23, IRRIGATED

This capability unit consists only of Pavant silt loam, 1 to 3 percent slopes. This is a shallow, well-drained soil that formed in alluvium derived from mixed igneous material. It is on alluvial fans and terraces. Elevation ranges from 6,100 to 6,900 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 12 to 14 inches.

This soil has a subsoil of loam. Permeability is moderate. About 2 to 3 inches of available water is held above the lime-cemented hardpan. Roots can penetrate to a depth of 10 to 20 inches, or down to the hardpan.

This soil is used for irrigated alfalfa, small grain, and pasture plants. The shallow rooting zone in these soils shortens the life of deep-rooted crops, such as alfalfa. This soil is not well suited to crops because it is shallow and has low available water capacity.

Furrow irrigation and border irrigation are suited to alfalfa, small grain, and pasture plants. Sprinklers can be used satisfactorily. Where used for alfalfa, small grain, and pasture plants, this soil needs about 1 to 1.5 inches of irrigation water every 5 to 7 days in periods of maximum water use.

CAPABILITY UNIT IVe–24, IRRIGATED

This capability unit consists of deep, somewhat excessively drained soils of the Phage and Pharo series. These soils formed in alluvium derived from mixed igneous and sedimentary material. Slope ranges from 3 to 10 percent. Elevation ranges from 5,900 to 6,800 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 12 to 14 inches.

These soils have a surface layer of loam or gravelly loam and a subsoil of gravelly loam or very gravelly sandy loam. Permeability is moderate to moderately rapid. About 4 to 5.5 inches of available water is held. Roots can penetrate to a depth of more than 5 feet. Runoff is slow to medium, and the hazard of erosion is slight to severe.

These soils are used for irrigated alfalfa, small grain, and pasture plants.

Furrow irrigation is suited if carefully applied, but sprinklers are better suited to the soils of this unit. Where used for alfalfa, small grain, and pasture plants, these soils need about 2 to 3 inches of irrigation water every 10 to 12 days in periods of maximum water use.

CAPABILITY UNIT IVs–24, IRRIGATED

This capability unit consists of deep, somewhat excessively drained soils of the Decca and Manderfield series. These soils formed in mixed alluvium derived from igneous and metamorphic materials. They are on alluvial fans, terraces, and rolling hills. Slope ranges from 1 to 6 percent. Elevation ranges from 5,400 to 6,200 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 9 to 14 inches.

These soils have a surface layer of loam, gravelly sandy loam, gravelly loam, or cobbly loam and a subsoil of gravelly loam, sandy clay loam, or clay loam. The substratum is very gravelly sandy loam or very gravelly sand. Permeability is moderate. About 3 to 5 inches of available water is held. Roots can penetrate to a depth of more than 5 feet. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are used for irrigated alfalfa, small grain, and pasture plants.

Furrow irrigation is suited to alfalfa, small grain, and pasture plants, but sprinkler irrigation is very desirable on these soils. Where used for alfalfa, small grain, and pasture plants, these soils need 1.5 to 2 inches of irrigation water every 7 to 10 days in periods of maximum water use.

CAPABILITY UNIT Vw–2, IRRIGATED

This capability unit consists of deep, poorly drained and somewhat poorly drained soils of the Chipman and James Canyon series, the Draper variant, and the James Canyon heavy variant. These soils formed in alluvium derived from mixed igneous and sedimentary materials. They are on alluvial fans, river terraces, valley bottoms, and flood plains. Slope ranges from 1 to 3 percent. Elevation ranges from 5,700 to 6,000 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 11 to 13 inches.

These soils have a surface layer of loam, silt loam, or silty clay loam and a subsoil of loam, silt loam, silty clay loam, or silty clay. Permeability is moderate to very slow. About 4 to 11 inches of available water is held. Roots can penetrate to the water table, which fluctuates with the season of year. Early in spring the water table may be near the surface; late in fall it may be 3 or 4 feet below the surface. Runoff is slow to medium, and the hazard of erosion is slight.

These soils are used mainly for meadow hay and pasture plants. Some areas that have better drainage are used for irrigated alfalfa and small grain. These soils can be drained easily, except for the James Canyon heavy variant, which is fine textured and has restricted permeability.

Furrow irrigation and border irrigation are suitable for alfalfa, small grain, and pasture plants. Sprinklers can be used satisfactorily. Where the soils are drained and the water table is maintained at a depth of about 4 feet, alfalfa, small grain, and pasture plants need about 2.5 to 3 inches of irrigation water every 12 to 15 days in periods of maximum water use.

CAPABILITY UNIT Vw–27, IRRIGATED

This capability unit consists of deep, poorly drained, moderately and strongly saline-affected soils of the James Canyon and Poganeab series and James Canyon heavy variant. These soils formed in alluvium derived from mixed igneous and sedimentary material. They are on alluvial flood plains, river terraces, and valley bottoms. Slope ranges from 1 to 3 percent. Elevation ranges from 5,700 to 6,000 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 10 to 13 inches.

These soils have a subsoil of loam, silt loam, silty clay loam, or silty clay. Permeability is moderately slow to very slow. About 7 to 12 inches of available water is held. The water table varies from near the surface to a depth of 30 inches. Runoff is slow, and the hazard of erosion is slight.

These soils are used for pasture plants or meadow hay. The main concerns in management are water control, leaching of soluble salts, and pasture management.

CAPABILITY UNIT IVe–M, NONIRRIGATED

This capability unit consists only of Yardley loam, 1 to 6 percent slopes. It is a deep, well-drained soil that

formed in alluvium derived from acid and intermediate igneous material. It is on alluvial fans and in mountain valleys. Elevation ranges from 6,700 to 7,700 feet. The frost-free period is 65 to 85 days, and the average annual precipitation is 16 to 20 inches.

This soil has a subsoil of clay loam. It is friable and absorbs water readily. Permeability is slow in the subsoil and moderate to slow in the substratum. This soil holds 11 to 12 inches of available water. The water supplying capacity is about 12 to 15 inches. Roots can penetrate to a depth of 5 feet or more. Runoff is medium, and the hazard of erosion is moderate.

This soil is used entirely for range. The main concerns of management are controlling erosion, increasing forage production, and proper range management. The present vegetation is big sagebrush, oakbrush, yellowbrush, and associated forbs and grasses. These soils are better suited to summer and fall grazing than to other uses. Where needed, brush clearing, spraying, seeding, and waterspreading can be used to improve the vegetation, reduce erosion, and increase production and quality of forage. Areas producing Gambel oak and the vegetation associated with it are not suitable for clearing and spraying. Proper range management is necessary to maintain the quality as well as the production of vegetation. Intermediate, slender, and topar wheatgrasses and smooth brome are suitable for seeding. Seeding should be done in fall, at a rate of 5 to 8 pounds of seeds per acre, and a deep furrow drill should be used. This is one of the better soils for range seeding in the survey area.

This soil is suited to nonirrigated crops. The main limitation is the cool, short growing season.

CAPABILITY UNIT IVe–UZ, NONIRRIGATED

This capability unit consists of deep, well-drained soils of the Etta, Hansel, Flowell, Mill Hollow, Mosida, Red Rock, and Ushar series. These soils formed in alluvium derived from mixed sedimentary and igneous material. They are on alluvial fans, terraces, outwash plains, and flood plains and in valleys. Slope ranges from 1 to 10 percent. Elevation ranges from 5,800 to 6,800 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 12 to 14 inches.

These soils have a surface layer of sandy loam, loam, gravelly loam, cobbly loam, silt loam, or clay. The subsoil is fine sandy loam, silt loam, loam, or silty clay loam. Permeability is moderate to slow. About 8 to 12 inches of available water is held. The water-supplying capacity is about 9 to 11 inches. Roots can penetrate to a depth of 5 feet or more. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

These soils are used mainly as range. Some areas in Millard County near Cove Fort, Dog Valley, and Eightmile are used for nonirrigated crops and pasture plants.

Nonirrigated farming is marginal and during dry years is submarginal. Runoff from surrounding hills during spring snowmelt and severe summer thunderstorms often cause damage to crops. A wheat-fallow system is the cropping system used. Nonirrigated pasture consists of crested wheatgrass or rye. The main concerns in management are conservation of moisture and control of erosion. Practices needed are stubble mulching, contour tillage, and water diversions. Where needed, the cover of native plants can be improved by mechanical clearing of trees and brush, spraying, range seeding, and water spreading. Proper range management is needed to improve and maintain the quality as well as the production of forage. Crested and Siberian wheatgrasses are suited to seeding. Drilling should be done late in fall or early in spring at the rate of 5 to 8 pounds of seed per acre, and a deep furrow drill should be used.

CAPABILITY UNIT VIe–M, NONIRRIGATED

This capability unit consists of deep and moderately deep, well-drained soils of the Cowers, Maple Mountain, Paice, and Yardley series, the Flowell variant, and the Mineral Mountain noncalcareous variant. These soils formed in alluvium and colluvium derived from mixed igneous material. Slope ranges from 2 to 30 percent. Elevation ranges from 6,800 to 7,800 feet. The frost-free period is 65 to 100 days, and the average annual precipitation is 14 to 20 inches.

These soils have a surface layer of coarse sandy loam, loam, or cobbly loam. The subsoil is gravelly sandy loam, loam, clay loam, or cobbly clay loam. Permeability is slow to moderately rapid. About 5 to 12 inches of available water is held. The water-supplying capacity is about 9 to 15 inches. Roots can penetrate to a depth of about 30 inches in the Paice soil, 40 inches in the Flowell variant and the Yardley soil, and 60 inches or more in the other soils. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

These soils are used as range. Native vegetation includes Gambel oak, snowberry, serviceberry, curlleaf, mountainmahogany, bitterbrush, big sagebrush, wheatgrasses, and bluegrasses.

The main concerns of management are moisture conservation, erosion control, proper range management, and improved forage production. Where needed, range clearing and seeding are suitable practices, except where oakbrush grows. Such plants as intermediate, Topar, and the slender wheatgrasses are suited. Drilling should be done late in fall or early in spring, and at the rate of 5 to 8 pounds of seed per acre, and a deep furrow drill should be used.

CAPABILITY UNIT VIe–U, NONIRRIGATED

This capability unit consists of deep and moderately deep, well-drained and somewhat excessively drained soils of the Blackett, Blue Star, Clegg, Deer Creek, Flowell, Mill Hollow, Mosida, Murdock, Phage, Pharo, Red Butte, Rob Roy, Snake Hollow, and Ushar series. These soils formed in alluvium derived from mixed sedimentary and igneous materials. Slope ranges from 1 to 30 percent. Elevation ranges from 5,400 to 7,500 feet. The frost-free period is 80 to 108 days, and the average annual precipitation is 12 to 18 inches.

These soils have a surface layer of coarse sandy loam, sandy loam, cobbly sandy loam, loam, gravelly loam, cobbly loam, silt loam, or cobbly silt loam. The

subsoil is coarse sandy loam, very gravelly coarse sandy loam, fine sandy loam, loam, gravelly loam, cobbly loam, silt loam, clay loam, silty clay loam, gravelly clay, or cobbly clay. Permeability is slow to moderately rapid in the subsoil and very slow to very rapid in the substratum. About 4 to 12 inches of available water is held. The water-supplying capacity is 5 to 13 inches. Roots can penetrate to a depth of about 24 inches in soils that have a lime-cemented hardpan and to a depth of 5 feet or more in the deep soils. Runoff is medium to rapid, and the hazard of erosion is slight to high.

These soils are used mostly as range; some areas, though submarginal, are used for nonirrigated crops. A large part of the acreage has a juniper- and pinyon-tree overstory and little or no understory. These areas have more erosion than areas that do not have an overstory. In places they are gullied. Other native vegetation is big sagebrush and associated grasses and forbs and, in some areas, Gambel oak.

The main concerns of management are conservation of moisture, control of erosion, proper management of range, and improvement of vegetation and of forage production. Where needed, tree and brush removal by mechanical methods, spraying, and seeding to suited forage species can be done on these soils. Among the suited plants are crested and Siberian wheatgrasses in areas where the annual precipitation is 12 to 14 inches and intermediate wheatgrass in areas where the precipitation is 14 to 18 inches. Drilling should be done late in fall or early in spring, and a deep furrow drill should be used. A seeding rate of 5 to 8 pounds per acre is generally used.

CAPABILITY UNIT VIw–2, NONIRRIGATED

This capability unit consists only of Wet alluvial land. This land is made up of deep, somewhat poorly drained and poorly drained gravelly or cobbly soils on bottom lands along the Beaver River. The soil materials vary considerably within short distances. They are dominantly gravelly or cobbly throughout. Permeability is moderate to very rapid. About 3 to 5 inches of available water is held. The water table generally is at a depth of 12 to 30 inches. Runoff is slow, and the hazard of erosion is slight.

This land is used as range and wildlife habitat.

Parts of this area are suitable for clearing and seeding, but other parts are not suitable. Onsite investigation is needed. The main management practices are proper grazing use and the seeding of suitable areas where needed.

CAPABILITY UNIT VIs–U, NONIRRIGATED

This capability unit consists of deep, well-drained and somewhat excessively drained soils of the Cokel and Manderfield series. These soils formed in alluvium and colluvium derived from mixed acid and intermediate igneous material. They are on alluvial fans, terraces, outwash plains, ridges, and hills. Slope ranges from 1 to 20 percent. Elevation ranges from 5,800 to 6,800 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 12 to 14 inches.

These soils have a surface layer of coarse sandy loam, cobbly coarse sandy loam, loam, gravelly loam, or cobbly loam. The subsoil is coarse sandy loam, gravelly coarse sandy loam, gravelly loam, or very gravelly loamy sand. Permeability is moderate to moderately rapid in the subsoil and moderate to very rapid in the substratum. About 3 to 5 inches of available water is held. The water-supplying capacity is 8 to 11 inches. Roots can penetrate to a depth of 5 feet or more. Runoff is slow to medium, and the hazard of erosion is slight to high.

These soils are used mainly as range, but one small area, though submarginal, is used for nonirrigated crops. Part of the area has an overstory of juniper and pinyon. Other native plants are big sagebrush, bitterbrush, and associated forbs and grasses.

The main concerns of management are conservation of moisture, control of erosion, proper management of range, and improvement in forage production. Where necessary, trees and brush can be removed by mechanical methods and suitable species seeded. Suitable species are crested wheatgrass and Siberian wheatgrass. Seeding should be done late in fall or early in spring, and a deep furrow drill should be used. A seeding rate of 5 to 8 pounds per acre is generally used.

CAPABILITY UNIT VIIe–M, NONIRRIGATED

This capability unit consists of deep, well-drained soils of the Maple Mountain series and Flowell variant. These soils formed in alluvium and colluvium derived from mixed igneous material. They are on mountain slopes. Slope ranges from 25 to 60 percent. Elevation ranges from 7,100 to 7,800 feet. The frost-free period is 65 to 85 days, and the average annual precipitation is 18 to 20 inches.

These soils have a surface layer of cobbly loam and a subsoil of sandy clay loam, very cobbly loam, cobbly clay loam, or cobbly clay. Permeability is moderate to slow. About 5 to 10 inches of available water is held. The water-supplying capacity is about 9 to 15 inches. Roots can penetrate to a depth of about 40 inches to 5 feet or more, depending on the depth to bedrock. Runoff is rapid, and the hazard of erosion is moderate to high.

These soils are used as range. Native vegetation includes Gambel oak, big sagebrush, snowberry, bitterbrush, bluebunch wheatgrass, native bluegrass, and associated forbs. Where needed the clearing and seeding of selected areas of soils that are at a lower elevation and that do not have Gambel oak may be done. Topar and slender wheatgrass are suitable for seeding. Seeding should be done late in fall or early in spring at a rate of 5 to 8 pounds of seed per acre, and a deep-furrow drill should be used.

CAPABILITY UNIT VIIe–S, NONIRRIGATED

This capability unit consists of deep, well-drained soils of the Alovar, Escalante, Fruitland, Haybourne, Kessler, and Penoyer series. The Hiko Peak soil in the complex with Escalante is in this unit. These soils formed in alluvium derived from, and residuum weathered from, mixed sedimentary and igneous materials. They are on alluvial fans, flood plains, valley bottoms,

and rolling hills. Slope ranges from 1 to 20 percent. Elevation ranges from 5,000 to 6,200 feet. The frost-free period is 100 to 120 days, and the average annual precipitation is 8 to 14 inches.

These soils have a surface layer of coarse sandy loam, cobbly coarse sandy loam, sandy loam, loam, gravelly loam, cobbly loam, or silt loam. The subsoil is sandy loam, very gravelly sandy loam, fine sandy loam, loam, very gravelly loam, silt loam, or silty clay loam. Permeability is slow to rapid. About 5 to 12 inches of available water is held. The water-supplying capacity is about 4 to 9 inches. Roots can penetrate to a depth of 5 feet or more. Runoff is slow to rapid, and the hazard of erosion is slight to high.

These soils are used mainly as range. One small area of Fruitland soils, though submarginal, is used for nonirrigated crops. Native vegetation includes shadscale, winterfat, big sagebrush, black sagebrush, greasewood, galleta, Indian ricegrass, western wheatgrass, and associated forbs. In areas of this unit, precipitation is mainly too low for range seeding. Vegetation can be improved by proper range management.

CAPABILITY UNIT VIIe–U, NONIRRIGATED

This capability unit consists of deep, well-drained and somewhat excessively drained, steep and very steep soils of the Phage and Ushar series. These soils formed in alluvium derived from mixed igneous and sedimentary material. Slope ranges from 30 to 70 percent. Elevation ranges from 5,900 to 6,800 feet. The frost-free period is 100 to 108 days, and the average annual precipitation is 12 to 14 inches.

These soils have a surface layer of gravelly loam or cobbly loam. The subsoil is very gravelly sandy loam, loam, gravelly loam, or clay loam. Permeability is moderate to moderately rapid. About 4 to 10 inches of available water is held. The water-supplying capacity is about 8 to 11 inches. Roots can penetrate to a depth of 5 feet or more. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

These soils are used as range. Most of this unit has a nearly closed stand of pinyon and juniper but only a sparse understory of big sagebrush, some bitterbrush, Indian ricegrass, bluegrass, and associated forbs. These soils are not suited to clearing and seeding because they are steep. Vegetation can be improved by proper range management.

CAPABILITY UNIT VIIs–M, NONIRRIGATED

This capability unit consists of shallow to deep, well-drained soils of the Mineral Mountain gravelly subsoil variant, and the Bearskin, Mud Springs, and Wallsburg series. These soils formed in alluvium derived from, and residuum weathered from, mixed igneous and sedimentary materials. They are on mountains. Slope ranges from 2 to 60 percent. Elevation ranges from 6,600 to 7,800 feet. The frost-free period is 65 to 100 days, and the average annual precipitation is 15 to 20 inches.

These soils have a surface layer of coarse sandy loam, cobbly coarse sandy loam, or very cobbly loam. The subsoil is cobbly coarse sandy loam, cobbly sandy loam, gravelly sandy clay loam, very cobbly sandy clay loam, loam, cobbly loam, very cobbly loam, or very cobbly clay loam. Permeability is moderate to moderately rapid. About 2 to 6 inches of available water is held. The water-supplying capacity is 7 to 13 inches. Roots can penetrate to the bedrock in the shallow soils and to a depth of 5 feet or more in the deep soils. Runoff is medium to rapid, and the hazard of erosion is moderate to high.

These soils are used as range. Native vegetation includes Gambel oak, curlleaf mountainmahogany, big sagebrush, juniper, slender wheatgrass, and associated forbs. Because of slope, soil depth, or a very cobbly surface, these soils are not suited to clearing and seeding. Vegetation can be improved by proper range management.

CAPABILITY UNIT VIIs–S, NONIRRIGATED

This capability unit consists of shallow to deep, well-drained and somewhat excessively drained soils of the Decca, Hiko Peak, Kessler, Shotwell, and Sigurd series. These soils formed in alluvium derived from, and residuum weathered from, mixed igneous, sedimentary, and metamorphic materials. Slope ranges from 1 to 30 percent. Elevation ranges from 5,200 to 6,100 feet. The frost-free period is 100 to 115 days, and the average annual precipitation is 9 to 12 inches.

These soils have a surface layer of coarse sandy loam, cobbly coarse sandy loam, gravelly sandy loam, cobbly sandy loam, loam, gravelly loam, cobbly loam, or very cobbly loam. The subsoil is very gravelly sandy loam, loam, silt loam, or gravelly loam, and the substratum ranges from loam or silt loam to very gravelly coarse sandy loam. Permeability is moderate to rapid in the subsoil and moderate to very rapid in the substratum. About 1.5 to 10 inches of available water is held. The water-supplying capacity is about 3.5 to 9 inches for the deep soils and 1.5 to 2 inches for the shallow soils. Roots can penetrate to a depth of 5 feet or more in the deep soils but only to the bedrock in the shallow soils. Runoff is slow to rapid, and the hazard of erosion is slight to high.

These soils are used as range. Native vegetation includes big sagebrush, Indian ricegrass, western wheatgrass, and associated forbs. Precipitation is too low for clearing and range seeding.

CAPABILITY UNIT VIIs–S8, NONIRRIGATED

This capability unit consists of deep, well-drained and moderately well drained soils of the Antelope Springs and Oasis series and the Antelope Springs variant. These soils have been moderately to strongly affected by salts and alkali. They formed in mixed alluvium. They are on alluvial fans and flood plains. Slope ranges from 1 to 3 percent. Elevation ranges from 5,400 to 6,000 feet. The frost-free period is 105 to 115 days. The average annual precipitation is 9 to 12 inches.

These soils have a surface layer of loam, sandy loam, or silt loam and a subsoil of fine sandy loam, loam, or clay loam. Permeability is moderately slow in the subsoil and moderate to slow in the substratum. About 6 to 9 inches water is held. The water-supplying capacity is about 4 to 6 inches because the soils

contain salts and alkali. Runoff is medium, and the hazard of erosion is slight to moderate.

These soils are used entirely as range. Among the forage plants that are better suited to grazing in winter than in other seasons are shadscale, greasewood, and salt-tolerant grasses. These soils are not suited to range seeding because they contain salts and alkali and because the precipitation is low. Vegetation can be improved somewhat by proper range management.

CAPABILITY UNIT VIIs–U, NONIRRIGATED

This capability unit consists of shallow to deep, well-drained and somewhat excessively drained soils of the Black Ridge, Cokel, Deer Creek, Firmage, Flowell, Kersick, May Day, McQuarrie, Mill Hollow, Mineral Mountain, Oakden, Pass Canyon, Pavant, Phage, Pharo, Red Butte, Rob Roy, Sheeprock, Snake Hollow, and Ushar series. These soils formed in alluvium and colluvium derived from, and residuum weathered from, mixed igneous and sedimentary materials. They are on alluvial fans, terraces, ridgetops, rolling hills, and outwash plains. Slope ranges from 1 to 60 percent. Elevation ranges from 5,400 to 7,500 feet. The frost-free period is 80 to 110 days, and the average annual precipitation is 12 to 18 inches.

These soils have a surface layer of coarse sandy loam to silt loam that is very cobbly, gravelly, cobbly, or very cherty in places. The subsoil is coarse sandy loam to clay and is very cobbly, very gravelly, cobbly, or gravelly in places. Permeability is slow to very rapid. Runoff is medium to rapid, and the hazard of erosion is moderate to high. About 1 to 10 inches of available water is held. The water-supplying capacity is 4 to 11 inches. Roots can penetrate to the lime-cemented hardpan or bedrock in the shallow soils and to a depth of 5 feet or more in the deep soils.

These soils are used as range. A large part of this unit has an overstory of juniper and pinyon trees. These areas are more eroded than areas that do not have trees. Other native plants are big sagebrush and some Indian ricegrass, bluebunch wheatgrass, and associated forbs. Because of slope, soil depth, or a very cobbly surface, these soils are not suited to clearing and seeding. Vegetation can be improved by proper range management.

CAPABILITY UNIT VIIIw–4

This capability unit consists only of Riverwash, which is mainly coarse-textured, gravelly, cobbly, or stony soil material that occurs in narrow drainageways. This unit has some value for esthetics, wildlife, and road fill material, but has little value for farming.

CAPABILITY UNIT VIIIs–X

This capability unit consists of Colluvial land, Rock land, Rock outcrop, Shale outcrop, and Mine wash. Colluvial land is steep to very steep and is on mountains and ridges. Shale outcrop is moderately steep and very steep and is on terrace escarpments and breaks. Mine wash waste material has accumulated west of the Sulphurdale Mine and is highly acid. Rock land is steep to very steep and occurs throughout the survey area.

These areas have some sparse vegetation and are used by wildlife. All but Mine wash have esthetic value. These areas have little or no value for farming. Colluvial land, Shale outcrop, and Rock land contribute to erosion on the soils below.

Estimated Yields

The yields information in this soil survey is based on the observations of the local soil conservationist, soil scientists, the county extension agent, the soil conservation district board, and on local farm records. If no information could be obtained for a particular soil, estimates were made on the basis of information obtained for a similar soil. Water supply fluctuates considerably from spring to fall. Water is plentiful in May and in short supply in late July.

Table 2 gives the yields of the principal irrigated crops and of the principal nonirrigated crop, which is wheat. Among the chief irrigated crops are alfalfa, pasture, and barley, but corn for silage is grown occasionally. The most common crop rotation is alfalfa for 8 years and barley for 2 years. After the second year in barley the field is seeded back to alfalfa. The yield data are based on the results of two alfalfa cuttings and a small third cutting in some years. Pasture is generally grown on the soils that have a high water table.

On the level of management in this survey area an average of 35 pounds of phosphate (P_2O_5) is applied annually on alfalfa and 10 tons of barnyard manure on corn for silage or, in the second year, on barley. Pasture receives 25 pounds of nitrogen and 20 pounds of phosphate (P_2O_5) annually, but receives barnyard manure only occasionally. In irrigated areas water is applied efficiently through proper land leveling, correct length of runs, use of good water control structures, and application of water in accordance with needs of the crop and of the soil. A wheat-fallow system is used in nonirrigated areas. Among the management practices used are stubble mulching, rod weeding at the proper time, cross-slope tillage, insect control, and drilling in fall.

Range[2]

The soils used as range in the survey area are in 21 range sites. These sites extend from the low valleys into the high mountains and range from 5,200 feet to 9,600 feet above sea level. The soils vary considerably. They range from gently sloping and deep to steep and very steep, shallow, and rocky. The average annual precipitation ranges from 8 inches on the semidesert sites to slightly more than 24 inches in the mountain sites. Of the 446,457 acres of range and watershed lands in the survey area, 81,955 acres is owned privately or by the State and 364,502 acres are public lands.

Until recent years, most of the range in this survey area was grazed by resident herds the year round and by nonresident herds in fall, winter, and spring. The

[2] By HORACE ANDREWS, range conservationist, and LAMAR R. MASON, State range conservationist.

TABLE 2.—*Estimated average yields per acre of principal crops*

Soil	Irrigated crops				Nonirrigated crop, wheat
	Alfalfa	Barley	Corn for silage	Pasture	
	Tons	*Bushels*	*Tons*	*A.U.M.*[1]	*Bushels*
Chipman silty clay loam				9	
Decca gravelly sandy loam, 3 to 6 percent slopes	4.0	65		8	
Decca loam, 1 to 3 percent slopes	5.0	75	15	9	
Decca loam, 3 to 6 percent slopes	4.5	70		8	
Draper loam, 1 to 3 percent slopes	5.0	80		10	
Draper loam, sandy subsoil variant	5.0	75		9	
Etta loam	5.5	80		10	23
Etta clay, heavy variant	5.0	70		10	21
Flowell association, 1 to 3 percent slopes:					
Flowell part	5.0	70		10	
Ushar variant	5.5	80		10	
Flowell loam, 3 to 6 percent slopes, eroded					21
Fruitland loam, 1 to 3 percent slopes	5.5	80	17	10	16
Fruitland loam, 3 to 6 percent slopes	5.5	75		10	16
Hansel silt loam, low lime variant	4.5	75	16	9	
James Canyon silt loam, 1 to 3 percent slopes				10	
James Canyon silt loam, strongly saline, 1 to 3 percent slopes					
James Canyon loam, clacareous variant	5.5	95	18	10	
James Canyon silty clay loam, heavy variant				10	
James Canyon silty clay loam, heavy variant, saline				8	
Manderfield loam, 1 to 3 percent slopes	5.0	75	15	9	
Manderfield loam, 3 to 6 percent slopes	5.0	70		8	
Manderfield loam, moderately deep over gravel, 1 to 3 percent slopes	5.0	80	16	9	
Manderfield gravelly loam, 1 to 3 percent slopes	4.5	65		8	
Manderfield cobbly loam, 1 to 6 percent slopes	4.5	65		8	16
Mosida loam, 1 to 3 percent slopes	5.5	100	18	12	
Mosida loam, 3 to 6 percent slopes	5.0	95		11	
Mosida loam, 1 to 6 percent slopes, eroded					23
Mosida loam, gravelly substratum, 1 to 6 percent slopes					16
Murdock silt loam, 1 to 3 percent slopes	4.5	65		9	15
Pavant silt loam, 1 to 3 percent slopes	4.0	65		8	
Phage gravelly loam, 3 to 10 percent slopes, eroded	4.0	65		8	
Pharo loam, 1 to 3 percent slopes	4.5	70	15	9	
Pharo loam, 3 to 10 percent slopes	4.0	65		8	16
Poganeab clay loam, 1 to 3 percent slopes				7	
Poganeab clay loam, deep over clay, 1 to 3 percent slopes				7	
Red Rock silt loam, 1 to 3 percent slopes					23
Ushar loam, 3 to 10 percent slopes	5.5	80		10	23
Ushar loam, 3 to 10 percent slopes, eroded					23

[1] A.U.M. is animal-unit-months, a term used to express the carrying capacity of pasture. It is the number of months during the grazing season that 1 acre will provide grazing for 1 animal unit (1 cow, 1 horse, or 5 sheep) without damage to the pasture.

nonresident herds of livestock are steadily diminishing. A considerable acreage of public land, which is administered by the Bureau of Land Management, and a large acreage of private land have been cleared and seeded for use as range for livestock and wildlife habitat. These practices also help to control erosion.

A range site is a kind of range that results from a combination of environmental factors, including soil, moisture, elevation, slope, exposure, and temperature, and that has a potential for producing a distinctive native plant community. Distinctions between range sites are recognized by differences in the kind or proportion of plants that compose the potential plant community or by significant differences in the total production of vegetation.

The range condition of an area is determined by comparing its present vegetation with the vegetation in a potential plant community for the site. The purpose of determining range condition is to provide an approximate measure of the deterioration that has taken place in the plant cover and a basis for predicting the degree of improvement possible. Accordingly, range condition is expressed in terms of range condition class, which represents the degree to which the present plant composition has departed from the native potential plant community.

In this survey area three climatic zones affect the use of the soils for range. These zones are discussed in the following paragraphs.

The *semidesert climatic zone* is characterized by cold winters with light snow and by hot dry summers. Annual precipitation ranges from 8 to 12 inches, with an average over the years of 9 inches. The moisture most beneficial to plants comes in winter and very early in spring and is stored in the soil for plant use as the weather warms. But, warm-season plants growing in this climatic zone do respond to, and grow from, the benefits of summer storms. These summer storms

are often very intense, or of cloudburst proportions, and the runoff is so rapid that it causes severe erosion. The water does not penetrate the soil deeply enough for plants to benefit from it.

The plant growth period for the cool-season plants begins about March 15 to April 1, and they mature or go dormant from June 5 to June 15 because of the lack of soil moisture and excessive evapotranspiration rates. Warm-season plants begin growth in May and sometimes continue to October 15. The cool-season grasses may green up late in summer or early in fall if sufficient rains occur.

The *upland climatic zone* is typified by the climate surrounding the town of Beaver. It has cold, snowy, long winters and short, warm summers. Annual precipitation averages about 13 inches but ranges from 12 to 18 inches. The moisture most beneficial to plant establishment and growth comes in winter and early in spring and is stored in the soil for plant use as the weather warms. Summer storms are not very effective for plant growth since they generally come as intermittent showers, which do not wet the soil to root depth, or as intense cloudbursts, which run off rapidly without penetrating the soil deep enough to be of benefit to the plants.

Plant growth starts April 1 to 15 and continues until about June 15 to 20, when grasses and forbs stop growing because of the lack of soil moisture and the excessive evapotranspiration. Shrubs and trees generally grow throughout the summer from deep moisture, but at a much reduced rate.

The *mountain climatic zone* is characterized by cool, dry summers and cold, snowy winters. Annual precipitation averages 17 inches but ranges from 16 to 24 inches. The moisture most beneficial to the growth and establishment of plants comes in winter and early in spring and is stored in the soil for plant use. Plant growth starts April 15 to May 1 and continues until July 20 to 31, when many plants go dormant because moisture is deficient. With late summer or fall precipitation, a regrowth period begins. Shrubs generally grow throughout the summer but at a reduced rate.

SEMIDESERT ALKALI FLATS RANGE SITE

This site consists of deep, well drained and moderately well drained, moderate to strongly saline-alkali soils of the Antelope Springs and Oasis series and the Antelope Springs variant. The elevation is 5,300 to 6,000 feet. To a depth of 5 feet, the available water capacity ranges from 8 to 11 inches and the water-supplying capacity is 5.5 to 8.5 inches. Only a small amount of this water is available to plants unless they are salt tolerant because the soils have a high content of salts. These soils also have a platy surface layer that reduces the water-intake rate. The surface layer of these soils is loam or silt loam; the subsoil is loam or clay loam; and the substratum is loam or sandy loam. Antelope Springs soils have an horizon of strong lime accumulation at a depth of about 8 to 18 inches.

The potential native plant community is made up of salt- or alkali-tolerant plants, or both. It consists of 40 to 50 percent shrubs, 40 to 50 percent grasses, and 3 to 5 percent forbs.

In the potential native plant community, bottlebrush squirreltail makes up about 30 percent, by weight, of the composition; Indian ricegrass, 5 percent; Sandberg bluegrass, 3 percent; western wheatgrass, 7 percent; scarlet globemallow, 2 percent; greasewood, 30 percent; Nuttall saltbush, 5 percent; shadscale, 7 percent; and winterfat, 5 percent. In addition, silverscale saltweed makes up 1 percent of the composition; gray molly, 3 percent; and other forbs, 2 percent; but these plants generally are not used by livestock or wildlife.

As a result of prolonged overuse, shadscale and greasewood increase rapidly and smotherweed, Russian thistle, and halogeton invade the site. In the advanced stages of overuse, this site may revert to nearly pure stands of greasewood or shadscale and scattered smotherweed and halogeton plants.

The soils of this site are not suitable for range renovation and respond slowly to good range management practices.

This range site produces about 1,500 pounds per acre of air-dry herbage in favorable years and 500 pounds in unfavorable years. Approximately 95 percent of this production is from plants that furnish forage for livestock.

SEMIDESERT STONY LOAM RANGE SITE

This site consists of deep, well-drained soils of the Decca, Hiko Peak, and Sigurd series. These soils are on alluvial fans and rolling foothills. Slopes range from 1 to 50 percent but are dominantly 1 to 10 percent. Elevation ranges from 5,100 to 6,000 feet. The available water capacity, to a depth of 5 feet, ranges from 3.5 to 5.5 inches, and the water supplying capacity is 4 to 8 inches. Runoff is medium.

The surface layer of these soils is coarse sandy loam or loam that is gravelly, cobbly, very cobbly, or extremely stony. The subsoil is gravelly sandy loam or loam, and the substratum is very gravelly sandy loam or loam. Hiko Peak and Decca soils have horizons of strong lime accumulation at a depth of 7 to 12 inches.

The potential native plant community is an open stand of shrubs and an understory of grasses and forbs. It consists of 50 to 60 percent grasses, 5 to 15 percent forbs, and 25 to 35 percent shrubs.

Bluebunch wheatgrass makes up about 30 percent, by weight, of the potential native plant community: bottlebrush squirreltail, 5 percent; Indian ricegrass, 10 percent; Sandberg bluegrass, 10 percent; arrowleaf balsamroot, 5 percent; hawksbeard, 3 percent; big sagebrush, 7 percent; black sagebrush, 7 percent; shadscale, 10 percent; and other forbs, 7 percent. In addition, other shrubs make up 6 percent of the composition, but these plants generally are not used by livestock or wildlife.

If excessively grazed, the grasses die out, and sagebrush, locoweed, and shadescale increase; then, cheatgrass and annual weeds invade the site. In the advanced stages of overuse, this site produces only big sagebrush, shadscale, locoweed, death camas, cheatgrass, and annual weeds.

The soils of this site are not suitable for range renovation practices. They can be improved, if necessary, by proper range management.

This range site produces about 1,050 pounds per acre of air-dry herbage in favorable years and 475 pounds per acre in unfavorable years. About 95 percent of this production is from plants that furnish forage for livestock.

SEMIDESERT LIMY LOAM RANGE SITE

This site consists of deep, well-drained soils of the Escalante and Kessler series. These soils are on alluvial fans, valley plains, or rolling hills. Slopes range from 1 to 20 percent. Elevation ranges from 5,500 to 6,100 feet. The available water capacity, to a depth of 5 feet, ranges from 5 to 9 inches, and the water supplying capacity is 4.5 to 8.5 inches. Runoff is medium.

The surface layer of these soils is sandy loam, loam, or gravelly, cobbly, or very cobbly loam. The subsoil is sandy loam or silt loam, and the substratum is loamy sand, loam, or cobbly loam. Typically these soils have a platy surface layer. Horizons of strong lime accumulation occur at a depth of 6 to 15 inches.

The potential native plant community is an open stand of shrubs and an understory of grasses and forbs. It consists of 45 to 55 percent grasses, 5 to 10 percent forbs, and 35 to 45 percent shrubs.

Bluebunch wheatgrass makes up about 5 percent, by weight, of the potential native plant community; bottlebrush squirreltail, 12 percent; Indian ricegrass, 17 percent; needleandthread, 13 percent; other grasses, 3 percent; scarlet globemallow, 2 percent; other forbs, 4 percent; black sagebrush, 15 percent; rubber rabbitbrush, 5 percent; winterfat, 10 percent; yellowbrush, 5 percent. In addition, other shrubs make up 7 percent of the composition, buckwheat, 1 percent, and hoods phlox, 1 percent, but these plants are not generally grazed by livestock and wildlife.

If this site is excessively grazed, sagebrush and shadscale increase rapidly, and cheatgrass and annual weeds invade the site. In the advanced stages of overuse, this site produces only annual weeds, cheatgrass, and sagebrush.

The soils of this site are not suitable for range renovation practices. They can be improved, if necessary, by proper range management.

This range site produces about 950 pounds of air-dry herbage per acre in favorable years and 400 pounds per acre in less favorable years. About 90 percent of this production is from plants that furnish forage for livestock.

SEMIDESERT LOAM RANGE SITE

This site consists of deep, well-drained soils of the Fruitland and Haybourne series. These soils are on alluvial fans, flood plains, and in alluvial valleys. Slope ranges from 1 to 6 percent. Elevation ranges from 5,200 to 5,900 feet. The available water capacity, to a depth of 5 feet, ranges from 6 to 9 inches. The water supplying capacity is 5.5 to 8.5 inches. Runoff is slow.

The surface layer of these soils is loam, and the subsoil and substratum are loam or sandy loam.

The potential native plant community is an open stand of shrubs and an understory of grass and forbs. It consists of 50 to 60 percent grasses, 10 to 20 percent perennial forbs, and 25 to 35 percent shrubs.

Bluebunch wheatgrass makes up 20 percent, by weight, of the potential native plant community; bottlebrush squirreltail, 8 percent; Indian ricegrass, 4 percent; needleandthread, 13 percent; Sandberg bluegrass, 5 percent; other grasses, 5 percent; arrowleaf balsamroot, 4 percent; hawksbeard, 3 percent; big sagebrush, 10 percent; winterfat, 4 percent, and other shrubs, 16 percent. In addition, other forbs make up 8 percent of the composition, but these plants generally are not grazed by livestock or wildlife.

If this site is excessively grazed, sagebrush increases rapidly and annual forbs invade the site. In the advanced stages of overuse, this site produces only sagebrush and annual forbs.

The soils of this site are not suitable for range renovation practices, except for a limited amount of clearing and seeding in some places. They can be improved, if necessary, by proper range management.

This range site produces about 1,100 pounds per acre of air-dry herbage in favorable years and 400 pounds per acre in unfavorable years. About 92 percent of this production is from plants that furnish forage for livestock.

SEMIDESERT SHALLOW LOAM RANGE SITE (8 to 10 INCH PRECIPITATION ZONE)

This site consists only of Shotwell very cobbly loam, a shallow, well-drained soil that is underlain, at a depth of 10 to 18 inches, by igneous bedrock. Slopes range from 10 to 30 percent. The elevation ranges from 5,200 to 5,600 feet. The available water capacity, above the bedrock, ranges from 1.5 to 2 inches, and the water-supplying capacity is about 2 to 4 inches. Runoff is rapid. The subsoil of this soil is loam.

The potential native plant community is an open stand of sagebrush and an understory of grasses and forbs. It consists of 45 to 55 percent grasses, 15 to 25 percent forbs, and 25 to 35 percent shrubs.

Bluebunch wheatgrass makes up about 13 percent, by weight, of this potential native plant community; bottlebrush squirreltail, 6 percent; Indian ricegrass, 5 percent; needleandthread, 6 percent; Sandberg bluegrass, 7 percent; other grasses, 3 percent; arrowleaf balsamroot, 8 percent; hawksbeard, 4 percent; scarlet globemallow, 2 percent; big sagebrush, 10 percent; bitterbrush, 8 percent; and black sagebrush, 9 percent. In addition, bullgrass makes up 10 percent of the composition; other forbs, 6 percent; and other shrubs, 3 percent. These plants generally are not used by livestock or wildlife.

If this site is excessively grazed, big sagebrush increases rapidly, and cheatgrass and annual weeds invade the site. In the advanced stages of overuse, this site may produce only big sagebrush, snakeweed, yellowbrush, cheatgrass, and annual weeds.

The soils of this site are not suitable for range renovation practices. They can be improved, if necessary, by proper range management.

This range site produces about 675 pounds per acre of air-dry herbage in favorable years and 350 pounds per acre in unfavorable years. About 80 percent of this production is from plants that furnish forage for livestock.

SEMIDESERT SILT LOAM RANGE SITE

This site consists of deep, well-drained soils of the Penoyer and Alovar series. These soils are on alluvial fans and in valleys. Slopes range from 1 to 10 percent. Elevation ranges from 5,200 to 6,200 feet. The available water capacity, to a depth of 5 feet, ranges from 10 to 11 inches, and the water-supplying capacity is about 5 to 9 inches. Runoff is slow to medium.

The surface layer of these soils is silt loam or loam and the subsoil and substratum are silt loam, silty clay loam or clay loam.

The potential native plant community is mostly grass. It consists of about 40 to 50 percent grasses, 20 to 30 percent forbs, and 25 to 35 percent shrubs.

Bluebunch wheatgrass makes up about 20 percent, by weight, of the potential native plant community; Indian ricegrass, 5 percent; Nevada bluegrass, 4 percent; Sandberg bluegrass, 6 percent; western wheatgrass, 3 percent; other grasses, 2 percent; arrowleaf balsamroot, 7 percent; penstemon, 4 percent; big sagebrush, 10 percent; winterfat, 15 percent; and other shrubs, 5 percent. In addition, phlox makes up 4 percent of the composition and other forbs, 10 percent; but these plants generally are not used by livestock or wildlife.

If this site is excessively grazed, yellowbrush and shadscale increase rapidly, and cheatgrass and annual weeds invade the site. In advanced stages of overuse, this site may produce only annual weeds and shadscale or big sagebrush.

The soils of this site are not suitable for range renovation practices. They can be improved, if necessary, by proper range management.

This range site produces about 1,025 pounds per acre of air-dry herbage in favorable years and 625 pounds per acre in unfavorable years. About 86 percent of this production is from plants that furnish forage for livestock.

UPLAND LIMY LOAM RANGE SITE

This site consists of deep to moderately deep, well-drained soils of the Mill Hollow series. These soils are on alluvial fans, outwash plains, mountains, and rolling hills. Slopes range from 1 to 30 percent. Elevation ranges from 5,800 to 6,800 feet. The available water capacity, to a depth of 5 feet, ranges from 7 to 8 inches, and the water-supplying capacity is about 7.5 to 11 inches. Runoff is medium.

The surface layer of these soils is loam, cobbly loam, or very cobbly loam. The subsoil is loam, and the substratum is extremely stony loam. Horizons of strong lime accumulation are at a depth of 8 to 16 inches.

The potential native plant community is an open stand of big sagebrush (fig. 4) and an understory of grasses and forbs. It consists of about 65 to 75 percent grasses, 5 to 15 percent forbs, and 15 to 25 percent shrubs.

Bluebunch wheatgrass makes up about 45 percent, by weight, of the potential native plant community; Indian ricegrass, 3 percent; other grasses, 22 percent;

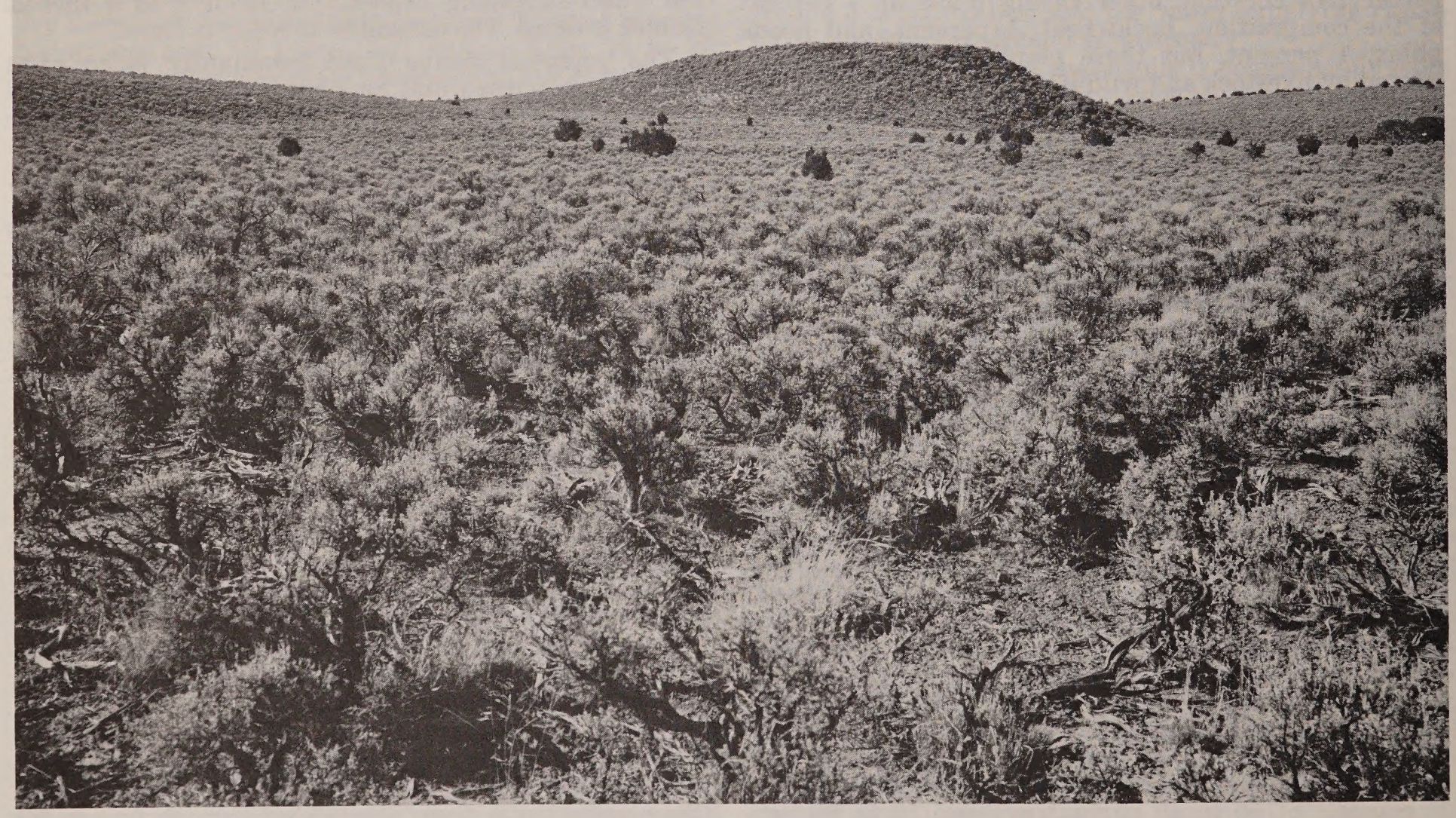

***Figure 4.*—Area of Upland Limy Loam range site. Big sagebrush is dominant.**

bastard toadflax, 4 percent; big sagebrush, 3 percent; bitterbrush, 10 percent; and other shrubs, 7 percent. In addition, phlox makes up 2 percent of the composition and other forbs 4 percent; but these plants generally are not grazed by livestock and wildlife.

If this site is excessively grazed, big sagebrush increases rapidly, and cheatgrass and annual weeds invade the site. In the advanced stages of overuse, this site may produce only annual weeds, cheatgrass, and big sagebrush.

Spraying of big sagebrush and proper use are better than other range improvement practices. Most of the soils of this site are suitable for clearing by plow and seeding by drill, but the Mill Hollow very cobbly loam, 2 to 10 percent slopes, and Mill Hollow very cobbly loam, 10 to 30 percent slopes, can be seeded effectively only by broadcasting the seeds.

This range site produces about 1,450 pounds per acre of air-dry herbage in favorable years and 425 pounds per acre in unfavorable years. About 94 percent of this production is from plants that furnish forage for livestock.

UPLAND LIMY LOAM (JUNIPER-PINYON) RANGE SITE

This site consists of deep, well-drained soils of the Blackett, Firmage, and Cokel series. These soils are on alluvial fans, ridges, and rolling hills. Slopes range from 3 to 20 percent. Elevation ranges from 6,100 to 6,800 feet. The available water capacity, to a depth of 5 feet, ranges from 3 to 6 inches, and the water-supplying capacity is about 5.5 to 9.5 inches. Erosion is moderate.

The surface layer of these soils is coarse sandy loam, cobbly coarse sandy loam, very cobbly loam, or cobbly loam. The subsoil is coarse sandy loam, light loam, or cobbly loam. The substratum ranges from cobbly loam or coarse sandy loam to gravelly coarse sand. A horizon of strong lime accumulation is at a depth between 8 and 20 inches.

The potential native plant community is an open savannah-like cover of juniper (fig. 5) and pinyon pine. The overstory density is 10 to 20 percent, and the understory density is 15 to 25 percent. The potential plant community consists of 50 to 60 percent grasses, 3 to 8 percent forbs, 5 to 10 percent shrubs, and 25 to 30 percent juniper and pinyon pine.

Bluebunch wheatgrass makes up about 30 percent, by weight, of the potential native plant community; Indian ricegrass, 10 percent; other grasses, 15 percent; and phlox, 2 percent; other forbs, 3 percent; pinyon pine, 8 percent; Utah juniper, 25 percent; and other shrubs, 7 percent. In addition, phlox makes up 2 percent of the composition; other forbs, 3 percent; pinyon pine, 8 percent; and Utah juniper, 25 percent, but these plants generally are not grazed by livestock or wildlife.

If this site is excessively grazed, juniper and pinyon pine increase rapidly and severely compete with the better forage plants for moisture and sunlight. Even-

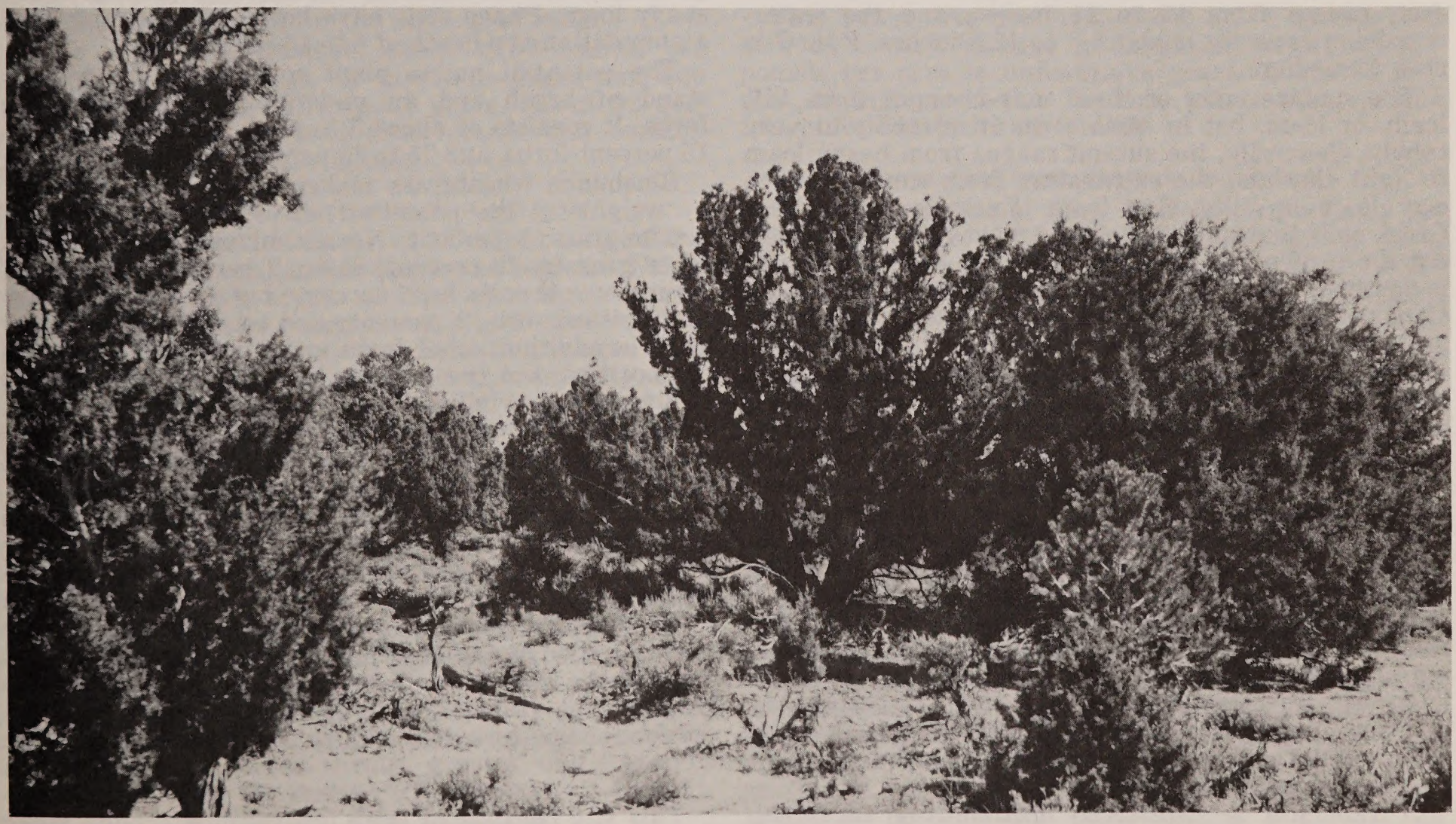

***Figure 5.*—Area of the Upland Limy Loam (Juniper-Pinyon) range site where juniper is dominant and the understory is sparse. The soil is in the Blackett series.**

tually, juniper and pinyon pine control the site so that little else can survive.

The woodland products of this site are of little economic importance. This site produces less than 0.1 of a juniper post per acre per year. It produces about 0.01 cord of wood from juniper and 0.04 cord from pinyon pine per acre per year. The growth of juniper and pinyon pine on this site is slow, and the plants are so scrubby that they are of little value as Christmas trees or for their nuts.

All the soils in this site are suitable for clearing and controlling brush by chaining or burning, and, except for Firmage very cobbly loam, 5 to 30 percent slopes, they are suitable for seeding by drill. The Firmage soil can be seeded effectively only by broadcasting the seed.

This range site produces about 1,400 pounds per acre of air-dry herbage in favorable years and 500 pounds per acre in unfavorable years. About 62 percent of this production is from plants that furnish forage for livestock and wildlife.

UPLAND LOAM RANGE SITE

This site consists of deep to moderately deep, well-drained soils of the Deer Creek, Rob Roy, Clegg, Etta, Mosida, Red Rock, and Ushar series and the Hansel variant. These soils are on alluvial fans, terraces, rolling hills, valley bottoms, and mountain side slopes. Slopes range from 1 to 30 percent but are dominantly 1 to 15 percent. Elevation ranges from 5,900 to 7,200 feet. The available water capacity, to a depth of 5 feet, ranges from 10 to 11 inches, and the water-supplying capacity is about 8 to 12.5 inches. Runoff is slow to medium.

The surface layer of these soils is sandy loam, silt loam, or loam, but in some areas it is cobbly or very cobbly. Generally, the subsoil ranges from heavy loam to light clay and the substratum from sandy loam to clay loam or silty clay loam. Exceptions are Deer Creek soils that have 20 to 40 percent cobbles throughout the profile and Rob Roy soils that have bedrock at a depth of about 30 inches. Deer Creek, Clegg, and Ushar soils have horizons of strong lime accumulation at a depth of 20 to 40 inches.

The potential native plant community is an open cover of big sagebrush, and an understory of grasses and weeds. It consists of about 60 to 70 percent grasses, 10 to 20 percent forbs, and 15 to 25 percent shrubs. Plant density is about 40 to 50 percent.

Bluebunch wheatgrass makes up about 35 percent, by weight, of the potential native plant community; Basin wildrye, 3 percent; Indian ricegrass, 5 percent; Nevada bluegrass, 3 percent; Sandberg bluegrass, 3 percent; other grasses, 6 percent; arrowleaf balsamroot, 3 percent; lupine, 2 percent; peavine, 3 percent; big sagebrush, 5 percent; bitterbrush, 7 percent; yellowbrush, 5 percent; and other shrubs, 13 percent. In addition, other forbs make up 7 percent of the composition; but these plants generally are not grazed by livestock or wildlife.

If this site is excessively grazed, big sagebrush increases rapidly, and cheatgrass, annual weeds, and pinyon-juniper invade the site rather rapidly. In the advanced stages of overuse, this site may produce only annual weeds, unpalatable perennial forbs, cheatgrass, and big sagebrush. The present trend of this site is one of declining forage production.

Except for Deer Creek very cobbly loam, 3 to 20 percent slopes, eroded, and Rob Roy very cobbly loam, 10 to 30 percent slopes, which are suitable only for the broadcasting of seeds, the soils of this site are suitable for clearing by plow and for seeding by drill.

This range site produces about 2,250 pounds per acre of air-dry herbage in favorable years and 700 pounds per acre in unfavorable years. About 93 percent of this production is from plants that furnish forage for livestock and wildlife.

UPLAND GRAVELLY LOAM RANGE SITE

This site consists of deep, gravelly, well-drained soils of the Phage, Pharo, and Snake Hollow series. These soils are on alluvial fans, terraces, and ridgetops. Slopes range from 1 to 30 percent. Elevation ranges from 5,400 to 7,000 feet. The available water capacity, to a depth of 5 feet, ranges from 4.5 to 5.5 inches, and the water-supplying capacity is about 6.5 to 9 inches. Runoff is slow to medium.

The surface layer of these soils is loam, sandy loam, or gravelly or cobbly loam, and the subsoil ranges from gravelly light clay loam to gravelly or very gravelly sandy loam, or coarse sandy loam. In some places the upper part of the subsoil is free of gravel. The substratum ranges from very gravelly loamy sand to gravelly silt loam but is dominantly very gravelly sandy loam. Phage soils have horizons of strong lime accumulation at a depth of 6 to 15 inches.

The potential native plant community is an open stand of brush and an understory of grasses and forbs. It consists of about 5 to 15 percent shrubs, 5 to 15 percent forbs, and 75 to 85 percent grasses.

Bluebunch wheatgrass makes up about 45 percent, by weight, of the potential native plant community; muttongrass, 8 percent; Nevada bluegrass, 7 percent; other grasses, 20 percent; daisy, 2 percent; elk thistle, 2 percent; other forbs, 6 percent; big sagebrush, 3 percent; bitterbrush, 2 percent; and other shrubs, 5 percent. In addition, other forbs make up 6 percent of the composition; but these plants generally are not grazed by livestock or wildlife.

If this site is excessively grazed, big sagebrush increases rapidly, and cheatgrass and annual weeds invade the site. In the advanced stages of overuse, this site may produce only annual weeds, cheatgrass, and big sagebrush.

These soils are for clearing by plow and seeding by drill.

This range site produces about 1,850 pounds per acre of air-dry herbage in favorable years and 450 pounds per acre in unfavorable years. About 94 percent of this production is from plants that furnish forage for livestock and wildlife.

UPLAND STONY LOAM RANGE SITE

This site consists of deep, gravelly or cobbly, well-drained soils of the Manderfield series. These soils are gently sloping to sloping and are on alluvial fans and

outwash plains. Slopes range from 1 to 6 percent. Elevation ranges from 5,800 to 6,100 feet. The available water capacity, to a depth of 5 feet, is 3 to 3.75 inches, and the water supplying capacity is about 5.5 to 8 inches. Runoff is slow to medium.

The surface layer of these soils is loam, gravelly loam, or cobbly loam. The subsoil is light clay loam over gravelly loam, and the substratum is gravelly sand.

The potential native plant community is an open stand of shrubs and an understory of grasses and forbs. It consists of about 60 to 70 percent grasses, 2 to 5 percent forbs, and 25 to 35 percent shrubs, but the composition fluctuates as a result of plant disease, insects, drought, fire, and other natural causes.

Bluebunch wheatgrass makes up about 55 percent, by weight, of the potential native plant community; Indian ricegrass, 5 percent; other grasses, 5 percent; Louisiana sagewort, 1 percent; Wright birdsfoot trefoil, 1 percent; big sagebrush, 5 percent; birchleaf mountainmahogany, 5 percent; black sagebrush, 10 percent; and yellowbrush, 5 percent. In addition, other forbs make up 3 percent of the composition and other shrubs 5 percent, but these plants generally are not used by livestock or wildlife.

If this site is excessively grazed, big sagebrush increases rapidly, and cheatgrass and annual weeds invade the site. In advanced stages of overuse, this site may produce only annual weeds, cheatgrass, and big sagebrush.

The soils of this site are suitable for the control of brush by plowing, and for the seeding of range.

This range site produces about 1,750 pounds per acre of air-dry herbage in favorable years and 600 pounds per acre in unfavorable years. About 92 percent of this production is from plants that furnish forage for livestock and wildlife.

UPLAND LOAM (JUNIPER-PINYON) RANGE SITE

This site consists of deep, well-drained soils of the Flowell, Deer Creek, and Ushar series and the Ushar variant. These soils are on alluvial fans, terraces, and valley plains. Slopes range from 3 to 70 percent but are dominantly 3 to 30 percent. Elevation ranges from 6,000 to 6,800 feet. The available water capacity, to a depth of 5 feet, ranges from 8 to 12 inches, and the water-supplying capacity is about 8.5 to 12 inches. Runoff is medium.

The surface layer of these soils is coarse sandy loam or loam that, in places, is gravelly, cobbly, or very cobbly. The subsoil is heavy loam to light clay, and the substratum is loam or sandy loam. In places the subsoil or substratum is gravelly or cobbly. Horizons of strong lime accumulation are at a depth of 20 to 30 inches, but the Ushar soil, thick solum varient, has either a weak accumulation of lime or none.

The potential native plant community is an open savannah-like stand of juniper and pinyon pine and an understory of scattered shrubs, grasses, and forbs. It consists of 45 to 55 percent grasses, 3 to 8 percent forbs, and 40 to 50 percent shrubs and trees.

Bluebunch wheatgrass makes up about 30 percent, by weight, of the potential native plant community; Indian ricegrass, 6 percent; western wheatgrass, 4 percent; other grasses, 10 percent; bitterbrush, 5 percent; and other shrubs, 10 percent. In addition, phlox makes up 1 percent of the composition; pussytoes, 1 percent; other forbs, 3 percent; pinyon pine, 5 percent; and Utah juniper, 25 percent; but these plants generally are not grazed by livestock and wildlife.

If this site is excessively grazed, juniper and pinyon pine increase rapidly to dominate the site and to exclude the better forage plants. Big sagebrush, cheatgrass, and annual weeds then move in to occupy the site. In the advanced stages of overuse, this site produces juniper and pinyon pine and sparse stands of annual weeds and dying big sagebrush. The present trend of this site is toward declining forage production and pure stands of juniper and pinyon pine.

Woodland of this site is of little economic importance. This site produces about 0.64 of a juniper post per acre per year, and 0.16 cord of wood from juniper and 0.01 cord from pinyon pine per acre per year. Economic production of charcoal briquets and chips for presswood is a possibility. At present, these trees have little value as Christmas trees or as nut producers.

The soils in this site are suitable for clearing and control of brush by chaining or burning. All the soils except Deer Creek very cobbly loam, 30 to 50 percent slopes, eroded; Flowell very cobbly loam, 10 to 30 percent slopes, eroded; Ushar very cobbly loam, eroded; and Ushar gravelly loam, 30 to 70 percent slopes, eroded, are suitable for seeding by drill.

This range site produces about 2,850 pounds per acre of air-dry herbage in favorable years and 500 pounds per acre in unfavorable years. About 65 percent of this production is from plants that furnish forage for livestock and wildlife.

UPLAND SAND (JUNIPER-PINYON) RANGE SITE

This site consists of deep, well-drained soils of the Sheeprock series. These soils are on rolling hills, ridges, and flood plains. Slopes range from 1 to 30 percent. Elevation ranges from 6,200 to 6,800 feet. The available water capacity, to a depth of 5 feet, ranges from 3 to 3.75 inches, and the water-supplying capacity is about 5.5 to 8 inches. These soils are highly erodible.

The surface layer of these soils is coarse sand or coarse sandy loam. The subsoil and substratum are fine gravelly coarse sand, coarse sand, or sand.

The potential native plant community consists of an open stand of juniper and a few pinyon pine and an understory of big sagebrush, black sagebrush, grasses, and forbs. It consists of about 15 to 25 percent grasses, 3 to 8 percent forbs, and 70 to 80 percent shrubs and juniper and pinyon pine.

Blue grama makes up about 3 percent, by weight, of the potential native plant community; Indian ricegrass, 5 percent; needleandthread, 3 percent; Nevada bluegrass, 3 percent; sandhill muhly, 3 percent; other grasses, 3 percent; big sagebrush, 8 percent; bitterbrush, 10 percent; and other shrubs, 8 percent. In addition, Utah juniper makes up 30 percent of the composition; Gambel oak, 9 percent; pinyon pine, 10

percent; cryptantha, 1 percent; and other forbs, 4 percent; but these plants generally are not grazed by livestock or wildlife.

If this site is excessively grazed, juniper and pinyon pine increase to such an extent that only an understory of cheatgrasses and annual weeds can grow.

The juniper and pinyon pine are so scrubby that they have little value for juniper posts, Christmas trees, or as nut producers. The juniper trees produce about 0.06 cord of wood per acre per year, and the pinyon pine produce about 0.01 cord.

The soils of this site are not suitable for range renovation practices. They can be improved, if necessary, by proper range management.

This range site produces about 1,300 pounds per acre of air-dry herbage in favorable years and 775 pounds per acre in unfavorable years. About 45 percent of this production is from plants that furnish forage for livestock and wildlife.

UPLAND SHALLOW HARDPAN (JUNIPER-PINYON) RANGE SITE

This site consists of shallow and well-drained soils of the Murdock, Oakden, Pavant, Black Ridge, and May Day series. These soils are on terraces, valley plains, mountain side slopes, and rolling hills. Slopes range from 1 to 40 percent, but are dominantly 1 to 10 percent. Elevation ranges from 6,000 to 7,000 feet. The available water capacity ranges from 1.5 to 3 inches above the hardpan, and the water-supplying capacity is about 3.5 to 6 inches. Runoff is medium to rapid, and erosion is moderate.

The surface layer of these soils is loam or silt loam that is cobbly or very cobbly in many places. The subsoil ranges from loam or silt loam to light clay and is cobbly in places. It is underlain by an indurated lime-cemented hardpan at a depth ranging from 10 to 30 inches but generally 10 to 20 inches.

The potential native plant community of this site is an open savannah-like cover of juniper and pinyon pine and an understory of grasses, forbs, and shrubs. The overhead density of pinyon pine and juniper is 15 to 20 percent. The understory is about 30 to 40 percent grasses, 5 to 10 percent forbs, and 55 to 65 percent shrubs and trees.

Bluebunch wheatgrass makes up 15 percent, by weight, of the potential native plant community; Indian ricegrass, 10 percent ; needleandthread, 3 percent; other grasses, 7 percent; other forbs, 5 percent; big sagebrush, 5 percent; bitterbrush, 3 percent; and other shrubs, 12 percent. In addition, phlox makes up 2 percent of the composition; pinyon pine, 8 percent; and Utah juniper 30 percent; but these plants generally are not grazed by livestock or wildlife.

If excessively grazed, juniper and big sagebrush increase, and cheatgrass and annual weeds invade the site rapidly. In the advanced stages of overuse, this site may produce only juniper and pinyon pine and sparse amounts of annual weeds and cheatgrass.

The range condition is declining over much of the area, although local areas are improving because grazing management is good. The Murdock soils of this site are suitable for chaining of juniper, clearing of brush, range seeding, water development, and good range management.

Woodland production on this site is of little economic value. The juniper and pinyon pine are so scrubby that they have little value for Christmas trees or as nut producers. The juniper trees produce about 0.37 of a juniper post per acre per year and 0.13 cord of wood per acre per year. The pinyon pine has no value as cordwood.

Only Murdock soils on this site are suitable for clearing and seeding.

This range site produces about 1,750 pounds per acre of air-dry herbage in favorable years and 750 pounds per acre in unfavorable years. About 60 percent of this production is from plant species that furnish forage for livestock and wildlife.

UPLAND STONY HILLS (JUNIPER-PINYON) RANGE SITE

This site consists of shallow, well-drained soils of the Kersick, McQuarrie, and Pass Canyon series, the McQuarrie variant, and the Snake Hollow variant. These soils are on mountains, ridges, and rolling hills. Slopes range from 2 to 60 percent. Elevation ranges from 5,400 to 7,000 feet. The available water capacity ranges from 1 to 3.5 inches above the bedrock, and the water-supplying capacity is about 3 to 7 inches. Runoff is medium to rapid, and erosion is moderate to severe.

The surface layer of these soils is coarse sandy loam to loam that is gravelly, cobbly, or very cobbly. The subsoil ranges from loam to clay loam and typically is cobbly or very cobbly. The underlying bedrock is at a depth of 10 to 20 inches.

The potential native plant community consists of a savannah-like cover of juniper and pinyon pine and an understory of grasses, forbs, and shrubs. It consists of about 55 to 60 percent grasses, 1 to 5 percent forbs, 35 to 45 percent shrubs, and 20 to 25 percent juniper and pinyon pine.

Bluebunch wheatgrass makes up 35 percent, by weight, of the potential native plant community; Indian ricegrass, 5 percent; muttongrass, 5 percent; Nevada bluegrass, 5 percent; other grasses, 7 percent; scarlet globemallow, 1 percent; big sagebrush, 3 percent; birchleaf mountainmahogany, 2 percent; bitterbrush, 3 percent; cliffrose, 4 percent; and other shrubs, 5 percent. In addition, other forbs make up 2 percent of the composition; pinyon pine, 5 percent; and Utah juniper, 18 percent; but these plants generally are not grazed by livestock and wildlife.

If this site is excessively grazed, juniper, pinyon pine, and big sagebrush increase will dominate the site so that they exclude all but traces of the better forage plants.

Woodland on this site is of little economic importance. This site produces about 0.30 of a juniper post per acre per year, and about 0.05 cord of juniper and 0.01 cord of pinyon pine per year. These trees have little value for Christmas trees or as nut producers.

The soils of this site are not suitable for range renovation practices. They can be improved by proper range management.

This range site produces about 1,900 pounds per acre of air-dry herbage in favorable years and 700 pounds per acre in unfavorable years. About 75 percent of this production is from plants that furnish forage for livestock and wildlife.

UPLAND STONY LOAM (JUNIPER-PINYON) RANGE SITE

This site consists of moderately deep or deep, well-drained, gravelly or cobbly soils of the Blue Star, Phage, Pharo, Manderfield, Mineral Mountain, Red Butte, and Snake Hollow series. These soils are on alluvial fans, terraces, ridgetops, rolling hills, and mountain slopes. Slopes range from 1 to 70 percent, but are commonly 3 to 30 percent. Elevation ranges from 5,900 to 7,200 feet. The available water capacity, to a depth of 5 feet, ranges from 3 to 6.5 inches, and the water-supplying capacity is about 5 to 8.5 inches. Runoff is medium to rapid, and erosion is moderate to severe.

The surface layer of these soils is loam, gravelly loam, cobbly loam, or very cobbly loam. The subsoil ranges from gravelly or cobbly clay loam to gravelly sandy loam or very gravelly sandy loam. The substratum ranges from cobbly or gravelly loam to very gravelly sandy loam or sand. Horizons of strong lime accumulation are at a depth of 6 to 24 inches in all soils but Manderfield and Snake Hollow soils.

The potential native plant community is an open savannah-like cover of juniper and pinyon pine and an understory of shrubs, grasses, and forbs. The overstory density of juniper and pinyon pine is 10 to 20 percent. It consists of 45 to 55 percent juniper, pinyon pine, and shrubs, 3 to 8 percent forbs, and 40 to 50 percent grasses.

Bluebunch wheatgrass makes up 25 percent, by weight, of the potential native plant community; Indian ricegrass, 4 percent; muttongrass, 5 percent; Nevada bluegrass, 5 percent; other grasses, 6 percent; hawksbeard, 2 percent; big sagebrush, 5 percent; black sagebrush, 7 percent; and other shrubs, 6 percent. In addition, goldenrod makes up 1 percent of the composition; other forbs, 2 percent; pinyon pine, 7 percent; and Utah juniper, 25 percent; but these plants generally are not grazed by livestock or wildlife.

If this site is excessively grazed, juniper, pinyon pine, and big sagebrush move in to claim it. In the advanced stages of overuse, this site is dominated by juniper and pinyon pine to the extent that the understory is annual weeds and traces of cliffrose, bitterbrush, big sagebrush, and grasses.

Woodland on this site is of low economic value. The juniper and pinyon pine have little value as Christmas trees or as nut producers. Juniper trees produce about 0.3 of a juniper post per acre per year and 0.05 cord of wood per acre per year.

The soils of this site are suitable mainly for clearing and control of brush by chaining or burning and are suitable for seeding by drill, except for Phage cobbly loam, 30 to 50 percent slopes, eroded; Phage very cobbly loam, 3 to 30 percent slopes, eroded; Phage gravelly loam, 30 to 70 percent slopes, eroded; Phage very cobbly loam, 30 to 60 percent slopes, eroded; Pharo very cobbly loam, 3 to 30 percent slopes, eroded; Mineral Mountain very cobbly loam, 30 to 60 percent slopes; Mineral Mountain very cobbly loam, 30 to 60 percent slopes, eroded; Red Butte very cobbly loam, 3 to 50 percent slopes, eroded; and Red Butte very cobbly loam, deep over bedrock, 3 to 30 percent slopes, eroded.

This range site produces about 1,450 pounds per acre of air-dry herbage in favorable years and 700 pounds per acre in unfavorable years. About 65 percent of this production is from plants that furnish forage for livestock and wildlife.

MOUNTAIN GRAVELLY LOAM RANGE SITE

This site consists of deep, well-drained soils of the Cowers and Yardley series and Flowell variant. These soils are on mountain side slopes. Slopes range from 2 to 30 percent. Elevation ranges from 6,800 to 7,800 feet. The available water capacity, to a depth of 5 feet, ranges from 5 to 7.5 inches, and the water-supplying capacity is about 9 to 13.5 inches. Runoff is medium where the plant cover is sparse. The surface layer of these soils is coarse sandy loam or loam. The subsoil is coarse sandy loam, sandy clay loam, or clay loam, and the substratum ranges from coarse sand to fine gravelly sandy loam.

The potential native plant community ranges from an open grassland to an open savannah-like cover that consists of Gambel oak clumps, big sagebrush, and other shrubs and an understory of grasses and forbs. It consists of 60 to 70 percent grasses, 10 to 20 percent forbs, and 15 to 25 percent shrubs.

Bluebunch wheatgrass makes up 30 percent by weight, of the potential native plant community; muttongrass, 10 percent; Nevada bluegrass, 10 percent; other grasses, 15 percent; arrowleaf balsamroot, 3 percent; Louisiana sagewort, 2 percent; hawksbeard, 2 percent; big sagebrush, 3 percent; birchleaf mountain-mahogany, 7 percent; and other shrubs, 8 percent. In addition, other forbs make up 8 percent of the composition and Gambel oak, 2 percent; but these plants generally are not grazed by livestock and wildlife.

If this site is excessively grazed or if fire burns the vegetation, Gambel oak increases rapidly. Big sagebrush, annual weeds, and annual grasses may increase or invade the site. In the advanced stages of overuse, this site may have only Gambel oak and annual weeds, or only big sagebrush, cheatgrass, and annual weeds.

The present trend is toward declining forage production on most of the site, but small areas have been improved by clearing and seeding and by good grazing management.

The soils on this site may be cleared by chain or plow and may be seeded by drill.

This range site produces about 2,300 pounds per acre of air-dry herbage in favorable years and 800 pounds per acre in unfavorable years. About 90 percent of this production is from plants that furnish forage for livestock and wildlife.

MOUNTAIN LOAM RANGE SITE

This site consists of deep or moderately deep, well-drained soils of the Maple Mountain, Yardley, Mineral Mountain, and Paice series and the Mineral Mountain

noncalcareous variant. These soils are on alluvial fans, in mountain valleys, on mountains, and on rolling hills. Slopes range from 1 to 50 percent but are dominantly 1 to 30 percent. Elevation ranges from 6,200 to 8,000 feet. The available water capacity, to a depth of 5 feet, ranges from 5 to 12 inches, and the water-supplying capacity is about 9 to 19 inches. Runoff is medium to rapid.

The surface layer of these soils is coarse sandy loam, loam, or cobbly loam. The subsoil is clay loam, clay, or cobbly clay loam, and the substratum ranges from coarse sandy loam to sandy clay loam, but Paice soils have an indurated, lime-cemented hardpan at a depth of 30 to 40 inches.

The potential native plant community ranges from open grassland to open savannah-like cover that consists of Gambel oak clumps, big sagebrush, and other scattered shrubs, and an understory of grasses and forbs (fig. 6). It consists of 60 to 70 percent grasses, 15 to 25 percent forbs, and 10 to 20 percent shrubs.

Bluebunch wheatgrass makes up 35 percent, by weight, of the potential native plant community; basin wildrye, 6 percent; bearded wheatgrass, 4 percent; muttongrass, 5 percent; western wheatgrass, 4 percent; other grasses, 11 percent; arrowleaf balsamroot, 2 percent; daisy, 2 percent; horsemint, 2 percent; lupine, 2 percent; other forbs, 10 percent; big sagebrush, 2 percent; bitterbrush, 2 percent; snowberry, 4 percent; yellowbrush, 2 percent; and other shrubs, 3 percent. In addition, yarrow makes up 2 percent of the composition and Gambel oak 2 percent; but these plants generally are not grazed by livestock or wildlife.

If this site is excessively grazed or if fire has burned the vegetation, Gambel oak and big sagebrush increase rapidly and cheatgrass and annual weeds invade the site. In the advanced stages of overuse, this site may produce only Gambel oak and annual weeds, or only big sagebrush, cheatgrass, and annual weeds.

The present trend on this site is toward declining forage production, much of this site is to be reseeded and better management is to be used.

This range site produces about 2,500 pounds per acre of air-dry herbage in favorable years and 1,200 pounds per acre in unfavorable years. About 96 percent of this production is from plants that furnish forage for livestock and wildlife.

Except for Maple Mountain cobbly loam, 25 to 50 percent slopes, the soils on this site are suitable for clearing by chain or plow in places where the vegetation is not restrictive. They are also suitable for seeding by drill.

MOUNTAIN SHALLOW LOAM RANGE SITE

This site consists of shallow, well-drained soils of the Bearskin, Mud Springs, and Wallsburg series. These soils are on ridgetops and mountain side slopes. Slopes range from 3 to 60 percent. Elevation ranges from 6,800 to 8,000 feet. The available water capacity ranges from 1 to 2.5 inches above the bedrock, and the water-supplying capacity is about 4 to 7.5 inches. Runoff is rapid.

The surface layer of these soils is very cobbly loam, cobbly coarse sandy loam, or coarse sandy loam. In some places the subsoil is 90 to 98 percent fractured bedrock and clay in the fractures, and the underlying bedrock is at a depth of 15 to 20 inches. In other places, the subsoil is gravelly clay loam, cobbly sandy loam, or clay loam underlain, at a depth of 10 to 24 inches, by granite bedrock.

The potential plant community is an open savannah-like cover of Gambel oak, serviceberry, curlleaf mountainmahogany, and other mountain shrubs and an understory of grasses and forbs. It consists of 50 to 60 percent grasses, 10 to 20 percent forbs, and 24 to 35 percent shrubs and trees.

Bluebunch wheatgrass makes up 15 percent, by weight, of the potential native plant community; basin

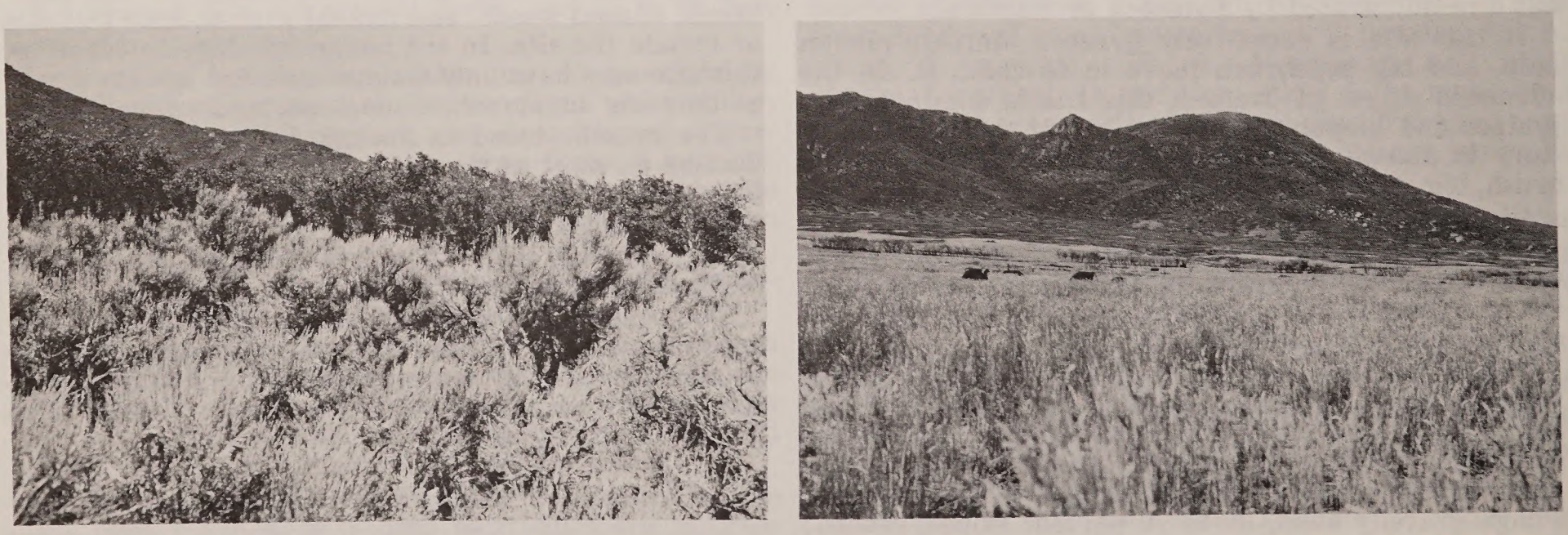

Figure 6.—**Mountain Loam range site. At left is an area where big sagebrush and Gambel oak are dominant. At right is an adjoining area that has been cleared and seeded to crested wheatgrass. The soil in both areas is in the Yardley series.**

wildrye, 8 percent; longtongue muttongrass, 7 percent; muttongrass, 8 percent; Nevada bluegrass, 7 percent; western wheatgrass, 4 percent; other grasses, 6 percent; arrowleaf balsamroot, 2 percent; Indian paintbrush, 1 percent; lupine, 1 percent; big sagebrush, 4 percent; bitterbrush, 10 percent; snowberry, 2 percent; yellowbrush, 2 percent; and other shrubs, 10 percent. In addition, stickseed makes up 2 percent of the composition; other forbs, 9 percent; and Gambel oak, 2 percent; but these plants generally are not grazed by livestock and wildlife.

If this site is excessively grazed, Gambel oak, curlleaf mountainmahogany, and big sagebrush increase rapidly, and cheatgrass and annual weeds invade the site. In the advanced stages of overuse, this site may produce only Gambel oak, curlleaf mountainmahogany, and annual weeds or only big sagebrush, annual weeds, and grasses.

The present trend is toward declining forage production on most of the site. Oakbrush and curlleaf mountainmahogany are taking over the site.

The soils of this site are not suitable for range renovation practices. They can be improved by proper range management.

This range site produces about 1,700 pounds per acre of air-dry herbage in favorable years and 600 pounds per acre in unfavorable years. About 87 percent of this production is from plants that furnish forage for livestock and wildlife.

MOUNTAIN STONY LOAM RANGE SITE

This site consists of deep to moderately deep, well-drained soils of the Mineral Mountain gravelly subsoil variant. These soils are on mountain side slopes and ridges. Slopes range from 2 to 60 percent but are dominantly 10 to 40 percent. Elevation ranges from 6,600 to 7,800 feet. The available water capacity, to a depth of 5 feet, ranges from 5 to 7.5 inches, and the water-supplying capacity is about 8.5 to 14 inches. Runoff is medium to rapid.

The surface layer of these soils is loam, cobbly loam, or very cobbly loam. Below that is loam to light clay that is dominantly very cobbly throughout.

The potential native plant community is mainly grass, but there are some shrubs and forbs. It consists of 65 to 75 percent, by weight, grasses, 5 to 15 percent forbs, and 15 to 25 percent shrubs and trees.

Bluebunch wheatgrass makes up 40 percent, by weight, of the potential native plant community; bearded wheatgrass, 2 percent; muttongrass, 5 percent; oniongrass, 10 percent; prairie junegrass, 5 percent; other grasses, 8 percent; arrowleaf balsamroot, 2 percent; other forbs, 7 percent; big sagebrush, 8 percent; birchleaf mountainmahogany, 2 percent; bitterbrush, 5 percent; and other shrubs, 5 percent. In addition, yarrow makes up 1 percent of the composition, but it generally is not grazed by livestock or wildlife.

If this site is excessively grazed, Gambel oak and big sagebrush increase rapidly, and cheatgrass and annual weeds invade to make up the understory. In the advanced stages of overuse, this site may produce only Gambel oak or big sagebrush and annual weeds and grasses.

The soils of this site are not suitable for range renovation practices. They can be improved by proper range management.

This range site produces about 2,500 pounds per acre of air-dry herbage in favorable years and 700 pounds per acre in unfavorable years. About 99 percent of the production is from plants that furnish forage for livestock and wildlife.

WET STREAM BOTTOMS RANGE SITE

This site consists only of Wet alluvial land. This land type is mainly deep, poorly drained or somewhat poorly drained, and gravelly or cobbly. Elevation ranges from 5,700 to 6,200 feet. Average annual precipitation is 11 to 13 inches. The water table varies with the flow of the Beaver River, but is generally between depths of 12 and 30 inches.

In general, the soil material is gravelly or cobbly. It ranges from loam or coarse riverwash sand, but generally is sandy loam or coarse sand. Considerable variation occurs within short distances.

The potential native plant community is a mixture of grasses, grasslike plants, forbs, shrubs, and trees. One-fourth or less of the total understory is shrubs and trees. The overstory ranges from a few trees to a canopy so dense in some places that it excludes nearly all the understory. This is especially true near the stream course. The plant community, although extremely variable, consists of 55 to 65 percent grasses, 10 to 15 percent forbs, and 25 to 30 percent trees and shrubs.

Tufted hairgrass makes up 20 percent, by weight, of the potential native plant community; blue wildrye, 5 percent; Nebraska sedge, 5 percent; sedges, 8 percent; slender wheatgrass, 5 percent; other grasses, 17 percent; aster, 2 percent; clover, 2 percent; common cowparsnip, 2 percent; peavine, 2 percent; and other shrubs, 11 percent. In addition, other forbs make up 4 percent of the composition; boxelder, 2 percent; Fremont cottonwood, 2 percent; narrowleaf cottonwood, 2 percent; river hawthorn, 2 percent; thinleaf alder, 2 percent; water birch, 2 percent; and willow, 5 percent, but these plants generally are not grazed by livestock and wildlife.

If excessively grazed, this site first declines to Kentucky bluegrass, trees, and shrubs and then to a thick cover of unpalatable shrubs and weeds. In advanced stages of overuse, it may produce only cheatgrass, unpalatable weeds, shrubs, and trees.

This range site will respond to clearing, leveling, seeding, rotation grazing, and proper pasture.

This range site produces about 3,500 pounds per acre of air-dry herbage in favorable years and 2,000 pounds per acre in unfavorable years. About 79 percent of this production is from plants that furnish forage for livestock and wildlife.

Wildlife [3]

All kinds of wildlife require suitable habitat that provides enough food, cover, water, and living space

[3] Utah Wildlife Resource Division furnished information on wildlife found within boundaries of the survey area.

to support them. If all the requirements of wildlife habitat are plentiful, the wildlife population in the area prospers, but if any one of the first three essentials is lacking, the environment may not provide a habitat for a given kind of wildlife. It is important that the requirements exist in the proper kind, quality, and quantity throughout the season. Maintenance of proper habitat and food supply is the key to the survival and abundance of wildlife. The value of the total habitat is restricted by the essential in shortest supply.

Soil has a direct effect on the four requirements, especially food and cover. The kinds of soils are generally related to land use and the resulting vegetation, both of which are closely related to the kinds of wildlife and the number of each kind that inhabit a given area. Through the food and cover plants it supports, the soil directly influences the life cycle of wildlife. Soils on farms in nonirrigated areas may provide living space and cover but little food and water; irrigated soils provide the food and water, especially in summer and fall.

Large animals.—This survey area is inhabited by one of the largest herds of mule deer in the nation. Generally, the mule deer summer on the ranges at high elevation and winter on the foothills at a lower elevation where the cover is sagebrush, pinyon, and juniper. A few deer spend their entire lives either in the areas of pinyon and juniper adjacent to farms or at a lower elevation along stream channels.

At present there are no elk in the area, but the State Fish and Game Department may establish a small resident herd.

Furbearers and other small animals.—Beaver, which are native to the area, were plentiful in the early days and are the animal for which the county and the town of Beaver are named. Muskrat also inhabit this area. Cottontail rabbits and pigmy rabbits are periodically abundant throughout the area. The blacktail jackrabbit inhabits mainly the lower areas of range but does invade cropped areas in search of green food.

Upland birds.—These birds are sage grouse, Chinese pheasant, mourning dove, California quail, ruffed grouse, band-tailed pigeons, and Merriam wild turkey.

Sage grouse, native to the uplands, furnished food for early settlers in the Beaver-Cove Fort Area. The lower areas, sagebrush plains and foothills, are their habitat. At times, large numbers inhabit the areas in and around cropped fields. Ruffed grouse, also native, are found in limited numbers in the survey area. They inhabit brushy woodland areas adjacent to springs and streams. For them, thickets of alder, willow, and aspen, interspersed with conifers, provide a more desirable habitat than other areas.

Chinese pheasants, which have been introduced, inhabit mainly irrigated areas. Mourning doves, which are migratory, arrive early in spring, and begin to migrate by August 20. California quail have been released by the Utah State Game Department. They inhabit irrigated fields. Band-tailed pigeons are also migratory and inhabit mainly the North Creek area and South Creek area, but small flocks have been observed in the Beaver Canyon area.

Waterfowl.—Flocks of migrating ducks and geese use some parts of the survey area for nesting and feeding.

Fish.—Trout inhabit all permanent streams, ponds, and reservoirs. Among the several species are native or cutthroat trout, rainbow trout, brook trout, and brown trout. The native, or cutthroat trout, were once abundant, and a limited number still inhabit the headwater of mountain streams. Rainbow trout are in all streams, lakes, and reservoirs. The streams throughout the area have been stocked with brook trout and brown trout, but they are fewer in number than rainbow trout. All of these fish provide good fishing as well as food for human consumption. The limited number of good springs and the short supply of water severely restrict the development of fishponds on farms in the survey area.

WILDLIFE SUITABILITY GROUP 1

This group consists of irrigated areas, wetlands, and stream channels. Among the soils are those in the James Canyon-Draper-Poganeab association and in parts of the Hiko Peak-Decca-Sheeprock and Phage-Ushar-Red Butte associations.

Wildlife suited to these soils are pheasants, mourning doves, and cottontail rabbits. Ducks, geese, muskrat, and beaver also use areas of these soils, but they are confined largely to the stream channels and the wetlands.

WILDLIFE SUITABILITY GROUP 2

This group consists mostly of nonirigated cropland, mainly in the Mosida-Etta-Ushar association. The wildlife habitat associated with these soils is suited to chukar partridge, California quail, and cottontail rabbits. Duck and geese frequent the streams and ponds. Other birds, such as pheasants and mourning doves, occasionally nest and seek refuge in these areas. Deer may frequent these lands in the course of their migration early in spring or in winters when the snow is deep.

WILDLIFE SUITABILITY GROUP 3

This group is made up of the rest of the survey area that is not in wildlife suitability groups 1 or 2. Wildlife suited to these soils are deer, chukar partridge, wild turkey, band-tail pigeons, sage grouse, mourning doves, elk, and cottontail rabbits.

Engineering Uses of the Soils [4]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bed-

[4] GORDON HANSEN, engineer, Soil Conservation Service, helped prepare this section.

rock, and soil slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highway, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables. Table 3 shows several estimated soil properties significant in engineering; table 4 gives interpretations for various engineering uses; and table 5 shows the results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 3 and 4, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning in soil science that is not used in engineering. The Glossary defines many of these terms commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system *(9)*, used by the Soil Conservation Service, Department of Defense, and other agencies, and the AASHO system (*1*), adopted by the American Association of State Highway Officials.

The Unified system is used to classify soils according to those properties that affect use as a construction material for purposes other than highway construction and maintenance and as a foundation material.

In the Unified system, soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content and are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL–ML.

The AASHO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHO classification for tested soils, with group index numbers in parentheses, is shown in table 4; the estimated classification, without group index numbers, is given in table 2 for all soils mapped in the survey area.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary.

Soil properties significant in engineering

Several estimated soil properties significant in engineering are given in table 2. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 2.

Depth to seasonal high water table is distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

The meaning of hydrologic groups shown in table 3 may not be familiar to some persons who use this survey. These data are used in estimating the total volume and peak runoff that can be expected from storms of a given amount and intensity. The data are useful in planning measures to control water.

TABLE 3.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such to other series that appear in the first column of this

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock or hardpan	Hydrologic group	Depth from surface	Classification			Coarse fraction greater than 3 inches
					USDA texture	Unified	AASHO	
	Feet	*Inches*		*Inches*				*Percent*
Alovar: ALD3	>5	>60	C	0–60	Loam, clay loam, or silty clay loam.	CL	A–6	0
*Antelope Springs: AND2— For properties of Kessler part of this unit, see Kessler series.	>5	>60	C	0–9 9–60	Loam or clay loam Loam or fine sandy loam.	ML SM–SC or SC	A–4 or A–6 A–2 or A–4	0 0
Antelope Springs variant: AS.	>5	>60	C	0–14 14–60	Clay loam or silt loam Clay loam to sandy loam	ML SM–SC or SC	A–4 or A–6 A–2 or A–4	0 0
*Bearskin: BCF2, BEF— For properties of Cowers part of these units, see Cowers series.	>5	10–20	D	0–10 10	Gravelly sandy clay loam to coarse sandy loam. Unweathered bedrock.	SC	A–2	0
*Blackett: BKE, BLE, BNE2— For properties of Blue Star part of BLE, see Blue Star series; for properties of Snake Hollow part of BNE2, see Snake Hollow series.	>5	>60	B	0–60	Coarse sandy loam to loam.	SM–SC or SC	A–2 or A–4	0
Black Ridge: BRF	>5	14–20	D	0–15 15–36 36	Very cobbly silt loam, clay, and clay loam. Hardpan. Unweathered bedrock.	CL	A–6 or A–7	20–30
Blue Star: BSD	>5	>60	B	0–19 19–60	Cobbly sandy loam and coarse sandy loam. Gravelly sandy loam and gravelly loam.	SM SM	A–2 or A–4 A–1 or A–2	5–10 0
Chipman: Ca	1–2½	>60	C	0–60	Silty clay loam and loam	CL	A–6	0
Clegg: CEF, CGF, CLF	>5	>60	B	0–10 10–32 32–60	Loam or cobbly loam Loam and clay loam Loam and sandy loam	SM–SC or SC CL SM or ML	A–4 A–6 A–4	0–35 0 0
Cokel: CME	>5	>60	C	0–22 22–60	Cobbly coarse sandy loam and coarse sandy loam, sandy loam. Gravelly coarse sand	SM SP–SM	A–2 or A–4 A–1	0–15 10–15
Colluvial land: CN— Properties are too variable to be estimated.	>5	>60						
*Cowers: COF2, CRF2, CSF2. For properties of Bearskin part of CSF2, see Bearskin series.	>5	>60	B	0–21 21–60	Loam and coarse sandy loam. Gravelly sandy loam to sandy loam.	SM–SC or SC SC or SM, SC–SM	A–2, A–4, or A–6 A–2	0 0
*Decca: DaC, DCF, DeB, DeC, DFD, DHF. For properties of Hiko Peak part of DHF, see Hiko Peak series.	>5	>60	B	0–15 15–60	Loam, sandy clay loam, cobbly or gravelly sandy loam or loam. Very gravelly sandy loam or sand.	SM–SC or SC GW–GM or GP–GM, GM	A–4 or A–6 A–1	0–30 0–15
Deer Creek: DKF2, DLE2	>5	>60	C	0–24 24–60	Cobbly loam to clay Cobbly sandy loam to sandy clay loam.	GC SM or GM	A–2 or A–7 A–6 or A–2, A–4	10–35 0–30
Draper: DrB	2½–3½	>60	C	0–48 48–60	Loam and very fine sandy loam. Gravel and sand	SM–SC or SC GP–GM or GM	A–4 A–1	0 0

significant in engineering

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring table. The symbol > means more than, the symbol < means less than]

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							
						Inches per hour	*Inches per inch of soil*	*pH*		
100	100	95–100	80–90	30–40	10–20	0.2–0.6	0.18–0.2	7.9–0.0	Moderate	Moderate.
100	100	80–90	65–80	30–40	5–15	0.06–0.2	0.17–0.18	7.9–9.0	Moderate	Moderate.
85–95	75–90	45–65	30–50	20–25	5–10	0.6–2.0	0.10–0.11	7.9–9.0	Low	Moderate.
100	100	75–85	70–80	30–40	5–15	0.06–0.2	0.17–0.18	9.1–10.0	Moderate	Moderate.
85–95	75–90	45–65	30–50	20–25	5–10	0.6–2.0	0.10–0.12	7.9–10.0	Low	Moderate.
60–80	45–60	35–50	20–30	25–35	10–15	0.6–2.0	0.10–0.18	6.1–6.5	Low	Moderate.
100	100	50–65	30–50	20–30	5–10	0.6–2.0	0.10–0.12	8.5–9.0	Low	Moderate.
80–90	75–85	70–85	50–75	30–50	15–30	0.06–0.2	0.14–0.18	6.1–7.8	Moderate	Moderate.
100	80–100	40–60	25–40	20–25	[1] NP–4	2.0–6.0	0.10–0.12	7.4–8.4	Low	Moderate.
60–85	55–80	35–55	20–35	20–25	NP–4	2.0–6.0	0.07–0.08	8.5–9.0	Low	Moderate.
100	100	95–100	80–95	30–40	10–20	0.06–0.2	0.16–0.18	7.4–8.4	Moderate	High.
85–100	75–85	60–70	40–50	25–30	5–10	0.6–2.0	0.16–0.18	7.4–7.8	Low	Moderate.
90–100	80–95	70–80	50–60	30–40	10–15	0.2–0.6	0.16–0.18	7.8–8.4	Low	Moderate.
90–100	80–95	65–80	40–55	25–35	NP–4	0.6–2.0	0.15–0.17	7.8–8.4	Low	Moderate.
90–100	85–95	50–70	25–40	20–25	NP–4	2.0–6.0	0.06–0.07	7.4–8.4	Low	Moderate.
55–65	50–60	20–30	5–10	20–25	NP	>6.0	0.04–0.05	7.9–8.4	Low	Low.
80–95	50–70	35–45	25–40	25–35	5–15	0.6–2.0	0.11–0.12	6.6–7.3	Low	Moderate.
70–85	50–70	30–50	20–30	20–30	NP–10	2.0–6.0	0.11–0.12	6.6–7.8	Low	Low.
70–95	60–85	55–75	40–50	20–30	5–15	0.6–2.0	0.10–0.15	6.6–7.8	Low	Moderate.
25–40	20–35	10–30	5–15	20–25	NP	6.0–20	0.03–0.04	7.4–7.8	Low	Low.
50–60	45–55	30–50	25–40	45–55	25–30	0.06–2.0	0.17–0.18	7.4–7.8	Moderate	Moderate.
45–95	35–90	30–80	15–50	30–40	5–15	0.6–2.0	0.08–0.15	7.9–8.4	Moderate	Moderate.
90–100	85–100	60–75	40–50	20–30	5–10	0.6–2.0	0.15–0.17	6.6–7.8	Moderate	High.
25–35	20–30	15–25	5–15	20–25	NP	>6.0	0.05–0.06	6.6–7.8	Low	Low.

TABLE 3.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock or hardpan	Hydrologic group	Depth from surface	Classification			Coarse fraction greater than 3 inches
					USDA texture	Unified	AASHO	
	Feet	*Inches*		*Inches*				*Percent*
Draper, variant: Ds	2–2½	>60	C	0–15	Loam and gravelly loam	SM or SC	A–4	0
				15–60	Gravel and sand or very gravelly sandy loam.	GP–GM or GM	A–1	0
*Escalante: ECD2, ESD2. For properties of Hiko Peak part of ESD2, see Hiko Peak series.	>5	>60	B	0–60	Sandy loam, loamy sand, and fine sand.	SM	A–2 or A–4, A–1	0
Etta: Et	>5	>60	C	0–60	Clay loam and loam	ML	A–4 or A–6	0
Etta variant: Ev	>5	>60	C	0–60	Clay, clay loam, and sandy clay loam.	CL	A–6 or A–7	0
*Firmage: FDF. For properties of Oakden soil in this unit, see Oakden series.	>5	>60	B	0–60	Cobbly loam and cobbly sandy loam.	CL–ML or CL	A–4 or A–6	10–15
*Flowell: FEC2, FGC2, FIB, FMC2, FUF. For properties of Ushar part of FUF, see Ushar series.	>5	>60	C	0–10	Cobbly loam	CL–ML or CL	A–4	0–15
				10–24	Light clay	CH	A–7	0–10
				24–60	Loam	ML–CL or CL	A–4	0
Flowell variant: FVF2, FWG2.	>5	>60	C	0–10	Cobbly loam and loam	CL–ML or CL	A–4 or A–6	10–30
				10–31	Cobbly clay	CL	A–6	30–50
				31–60	Very cobbly loam	GM–GC or GC, SM–SC or SC	A–4	40–70
Fruitland: FxB, FxC, FZC2	>5	>60	B	0–60	Light loam or sandy loam.	CL–ML or CL	A–4	0
Hansel: HAB	>5	>60	C	0–39	Silty clay loam	CL	A–6	0
				39–60	Silty clay	CL	A–6 or A–7	0
Hansel variant: He	>5	>60	C	0–60	Silt loam and silty clay loam.	CL	A–6	0
Haybourne: HHD	>5	>60	B	0–48	Coarse sandy loam and coarse sandy clay loam.	SC	A–2	0
				48–60	Coarse sand or fine gravelly coarse sand.	SW–SM	A–1	0
*Hiko Peak: HIF, HKD, HPE, HRE. For properties of Decca part of HPE, see Decca series; for properties of Fruitland part of HRE, see Fruitland series.	>5	>60	B	0–34	Gravelly or cobbly loam, sandy loam, or loam.	SM–SC, SM, or GM–GC	A–2	0–25
				34–60	Very gravelly loamy coarse sand.	SP–SM, GP–GM	A–1	5–25
James Canyon: JcB, JeB	0–2½	>60	C	0–60	Loam and silt loam	CL	A–6	0
James Canyon, calcareous variant: Jm.	1–3	>60	B	0–60	Loam	CL	A–6	0
James Canyon heavy variant: Jn, Jo.	0–1½	>60	C	0–60	Silty clay loam and silty clay.	CL	A–6 or A–7	0
Kersick: KCF	>5	10–20	D	0–17	Cobbly loam	CL	A–6	10–30
				17	Unweathered bedrock.			
*Kessler: KED, KLE, KME, KPE. For properties of Hiko Peak part of KME, see Hiko Peak series; for properties of Penoyer part of KPE, see Penoyer series.	>5	>60	C	0–3	Very cobbly loam and loam.	GM–GC or GC, SC	A–2 or A–4 or A–6	15–30
				3–60	Silt loam and loam	ML or MH	A–6 or A–7	0–5

significant in engineering—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							
						Inches per hour	*Inches per inch of soil*	*pH*		
90–100	85–100	60–75	40–50	20–30	5–10	0.6–2.0	0.15–0.17	6.6–7.8	Moderate	High.
25–35	20–30	15–25	5–15	20–25	NP	>6.0	0.05–0.06	6.6–7.8	Low	Low.
70–95	55–90	40–80	20–40	15–25	NP–4	0.6–2.0	0.09–0.11	8.5–9.0	Low	Moderate.
90–100	80–100	80–90	50–75	30–40	5–15	0.2–0.6	0.15–0.17	6.6–7.3	Moderate	Moderate.
95–100	95–100	90–100	70–85	35–45	15–25	0.06–0.2	0.18–0.2	6.6–7.8	High	Moderate.
75–90	70–85	60–75	50–60	20–30	5–15	0.6–2.0	0.08–0.09	7.9–9.0	Low	Moderate.
90–100	90–100	85–90	60–75	20–30	5–10	0.6–2.0	0.17–0.2	7.4–7.8	Low	Moderate.
90–100	90–100	85–90	70–80	50–55	30–35	0.06–0.2	0.16–0.18	7.4–7.8	High	Moderate.
90–100	85–95	70–85	60–70	20–30	5–10	0.2–0.6	0.17–0.2	8.5–9.0	Moderate	Moderate.
85–95	70–80	65–75	50–70	20–30	5–15	0.6–2.0	0.12–0.15	7.4–7.8	Moderate	Moderate.
75–85	70–80	65–75	60–70	30–40	10–20	0.06–0.2	0.08–0.13	7.4–7.8	High	Moderate.
65–85	60–80	55–75	40–50	20–30	5–10	0.6–2.0	0.07–0.11	7.9–8.4	Low	Moderate.
85–100	80–95	60–80	50–70	20–30	5–10	0.6–2.0	0.10–0.15	7.4–8.4	Low	Moderate.
100	100	90–100	85–95	30–40	10–20	0.2–0.6	0.18–0.2	7.9–9.0	Moderate	Moderate.
100	100	90–100	85–95	35–45	15–25	0.06–0.2	0.18–0.2	7.9–9.0	High	Moderate.
100	100	90–100	80–90	30–40	10–20	0.2–0.6	0.18–0.2	6.1–8.4	Moderate	Moderate.
80–90	50–70	35–45	20–35	25–35	10–15	0.6–2.0	0.10–0.12	7.4–7.9	Low	Moderate.
70–80	40–50	15–30	5–10	20–25	NP	6.0–2.0	0.05–0.06	8.5–9.2	Low	Low.
60–75	50–60	40–50	25–35	20–35	5–10	2.0–6.0	0.12–0.15	7.9–9.0	Low	Low.
45–60	25–35	10–15	5–10	20–30	NP	6.0–2.0	0.04–0.05	7.9–9.0	Low	Low.
100	100	85–100	80–95	20–35	10–20	0.2–0.6	0.13–0.17	7.4–7.8	Moderate	High.
100	90–100	70–80	60–70	20–30	10–20	0.6–2.0	0.13–0.17	7.4–8.4	Moderate	High.
100	100	90–100	85–95	30–45	15–25	0.06–0.2	0.18–0.19	7.4–8.4	Moderate to high.	High.
85–95	70–80	65–75	50–70	20–30	10–20	0.6–2.0	0.12–0.15	7.9–8.4	Moderate	Moderate.
60–80	50–70	45–65	30–50	20–35	5–20	0.6–2.0	0.12–0.14	8.5–9.0	Moderate	Moderate.
75–85	70–80	65–80	60–75	35–60	10–25	0.6–2.0	0.14–0.17	8.5–9.0	Moderate	Moderate.

TABLE 3.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock or hardpan	Hydrologic group	Depth from surface	Classification			Coarse fraction greater than 3 inches
					USDA texture	Unified	AASHO	
	Feet	*Inches*		*Inches*				*Percent*
Manderfield: MaB, MaC, MBB2, McB, MdB, MeC, MFC2.	>5	>60	B	0–24	Gravelly loam, loam, and clay loam.	SM–SC or SC or GC or GM–GC	A–2 or A–4 or A–6	0–25
				24–60	Very gravelly loamy sand.	GP, GP–GM	A–1	0–15
Maple Mountain: MGG	>5	>60	B	0–10	Cobbly loam	GC	A–2 or A–6	10–40
				10–60	Cobbly clay loam and sandy clay loam.	GC or CL	A–6 or A–2, A–7	10–40
*May Day: MHG, MIE. For properties of Deer Creek part of MIE, see Deer Creek series.	>5	15–20	D	0–17	Very cobbly loam and very cobbly sandy clay loam.	GM or SM, GC or SC	A–2 or A–4 or A–6	20–40
				17	Indurated hardpan.			
McQuarrie: MKF	>5	12–20	D	0–14	Clay loam, very cobbly loam, and loam.	CL–ML or ML	A–4 or A–6	0–30
				14–19	Very cobbly clay loam	GC,–GM–GC	A–2 or A–4 or A–6	20–40
				19	Unweathered bedrock.			
McQuarrie variant: MLF	>5	10–18	D	0–18	Very cobbly loam or very cobbly coarse sandy loam.	GW–GM, GP–GM	A–1	50–60
				18	Unweathered bedrock.			
*Mill Hollow: MMD, MNF, MOF. For properties of Pharo part of MNF, see Pharo series; for properties of Ushar part of MOF, see Ushar series.	>5	>60	B	0–34	Loam and very cobbly loam.	ML or CL or MH	A–6 or A–7	0–30
				34–60	Extremely stony loam	CL	A–6	30–50
*Mineral Mountain: MPG, MRG2. For properties of Snake Hollow part of MRG2, see Snake Hollow series.	>5	>60	C	0–8	Very cobbly loam and loam.	CL	A–6	0–40
				8–34	Cobbly light clay and cobbly clay loam.	CL	A–6 or A–7	0–20
				34–60	Light loam and cobbly loam.	CL–ML or CL	A–4	0–10
Mineral Mountain gravelly subsoil variant: MSE, MSG2.	>5	>60	C	0–12	Very cobbly loam	CL	A–6	30–40
				12–60	Very cobbly clay loam and very cobbly loam.	CL	A–6	40–60
Mineral Mountain non-calcareous variant: Part of CRF2. Mapped only in an association with Cowers soils.	>5	>60	C	0–21	Coarse sandy loam and heavy clay loam.	CL–ML or CL	A–4 or A–6	0
				21–60	Coarse sandy loam and coarse sand.	SM	A–1	0
Mine wash: MT	>5	>60	C	0–5	Sand	SP or SW	A–1	0
				5–60	Clay loam	CL	A–6	0
Mosida: MuB, MuC, MuC2, MVC3.	>5	>60	B	0–60	Loam and silt loam	ML, CL–ML, CL	A–4	0
Mosida, gravelly substratum phase: MwC.	>5	>60	B	0–36	Loam	ML, CL–ML, CL	A–4	0
				36–60	Gravelly loam	GM–GC or GC, SM–SC or SC	A–2 or A–4	0
Mud Springs: MXF	>5	24–36	C	0–25	Cobbly coarse sandy loam.	SM	A–4 or A–2	10–20
				25	Partly weathered bedrock.			
Murdock: MYB	>5	20–36	C	0–27	Silt loam	ML, CL–ML CL	A–4	0–10
				27	Indurated hardpan.			

significant in engineering—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							
						Inches per hour	*Inches per inch of soil*	*pH*		
60–90	45–70	30–60	20–50	20–30	5–15	0.6–2.0	0.12–0.7	7.4–8.4	Moderate	Moderate.
20–35	15–25	5–10	0–10	20–25	NP	>6.0	0.03–0.05	8.5–9.0	Low	Low.
45–70	35–60	30–55	25–50	25–35	10–20	0.6–2.0	0.15–0.17	6.1–6.5	Low	Moderate.
45–90	40–80	30–70	25–60	30–55	15–30	0.2–0.6	0.15–0.17	6.1–7.8	Moderate	Moderate.
60–80	50–80	40–75	25–50	30–40	5–15	0.2–0.6	0.09–0.12	7.4–8.4	Low	Moderate.
80–100	70–100	65–95	60–80	25–40	5–15	0.6–2.0	0.14–0.2	7.4–8.4	Moderate	Moderate.
50–70	40–65	35–60	30–50	20–35	5–15	0.6–2.0	0.09–0.10	7.9–8.4	Low	Low.
25–35	15–25	10–15	5–10	20–25	NP–5	2.0–6.0	0.06–0.08	7.9–8.4	Low	Low.
70–90	65–85	60–80	50–70	30–55	10–20	0.6–2.0	0.14–0.19	7.9–9.0	Moderate	Moderate.
70–90	65–85	55–70	50–60	30–40	10–20	0.6–2.0	0.08–0.1	8.5–9.0	Low	Low.
80–100	75–100	60–80	50–60	20–30	10–15	0.6–2.0	0.10–0.13	6.1–6.5	Moderate	Moderate.
85–100	80–100	65–80	60–70	35–50	20–30	0.06–0.2	0.12–0.14	6.6–7.8	Moderate	Moderate.
80–100	75–100	70–80	50–70	20–30	5–10	0.6–2.0	0.08–0.10	8.5–9.0	Moderate	Moderate.
80–100	75–100	60–80	50–60	20–30	10–15	0.6–2.0	0.08–0.1	6.6–7.8	Moderate	Moderate.
85–100	80–100	65–80	60–70	30–40	15–25	0.2–0.6	0.08–0.1	6.6–7.8	Moderate	Moderate.
85–95	75–85	60–75	50–70	25–35	5–15	0.2–0.6	0.18–0.2	6.6–7.3	Moderate	Moderate.
70–80	40–50	20–30	15–20	20–30	NP–4	2.0–6.0	0.08–0.1	6.6–7.3	Low	Moderate.
85–100	50–65	20–40	0–5	15–20	NP	>6.0	0.06–0.07	<4.5	Low	Low.
90–100	80–100	60–70	55–60	30–40	15–25	0.2–0.6	0.18–0.2	<4.5	Moderate	Moderate.
100	95–100	90–100	65–80	20–30	NP–10	0.6–2.0	0.12–0.15	6.6–7.8	Low	Moderate.
100	95–100	90–100	65–80	20–30	NP–10	0.6–2.0	0.14–0.16	6.6–7.8	Low	Moderate.
50–80	40–70	30–60	25–40	20–30	5–10	0.6–2.0	0.09–0.10	6.6–7.8	Low	Moderate.
80–100	70–90	60–80	30–45	20–30	NP	2.0–6.0	0.08–0.10	6.1–6.5	Low	Moderate.
100	90–100	80–90	70–80	20–30	NP–10	0.6–2.0	0.17–0.2	6.6–8.4	Low	Moderate.

TABLE 3.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock or hardpan	Hydrologic group	Depth from surface	Classification			Coarse fraction greater than 3 inches
					USDA texture	Unified	AASHO	
	Feet	*Inches*		*Inches*				*Percent*
*Murdock, cobbly silt loam phase: MZF2. For properties of Flowell part of this unit, see Flowell series.	>5	20–36	C	0–36 36	Cobbly silt loam and silt loam. Indurated hardpan.	ML, CL–ML, CL	A–4	10–45
Oakden: Part of FDF	>5	6–12	D	0–11 11	Cobbly loam and loam Indurated hardpan.	ML, CL–ML, CL	A–4	10–15
Oasis: OAB	>5	>60	B	0–60	Light loam and sandy loam.	SM–SC or SC, CL or CL–ML	A–4	0
Paice: PAD	>5	20–60	C	0–31 31	Cobbly loam, loam, and clay loam. Indurated hardpan.	CL	A–6	0–15
Pass Canyon: PBF3, PCF2	>5	5–20	D	0–14 14	Very cobbly coarse sandy clay loam, loam, or cobbly clay loam. Unweathered bedrock.	CL–ML or CL	A–4 or A–6	0–30
Pavant: PdB, PEC, PFG	>5	11–20	D	0–18 18	Loam, cobbly loam, or very cobbly loam. Indurated hardpan.	CL–ML or CL	A–4 or A–6	0–40
*Penoyer: PGB, PHD. For properties of Hiko Peak part of PHD, see Hiko Peak series.	>5	>60	C	0–60	Silt loam or loam	CL–ML or CL	A–4 or A–6	0
*Phage: PID2, PkD2, PLF2, PLG2, PMF2, PNG2, POF2, PPF2, PRF2, PSF2. For properties of Black Ridge part of POF2, see Black Ridge series; for properties of Pass Canyon part of PPF2, see Pass Canyon series; for properties of Red Butte part of PRF2, see Red Butte series; for properties of Ushar part of PSF2, see Ushar series.	>5	>60	B	0–13 13–63	Cobbly loam, very cobbly loam, loam, or gravelly loam. Very gravelly loam or very gravelly sandy loam.	SM or ML GM	A–4 A–2 or A–1	0–30 5–20
*Pharo: PtB, PtD, PUD2, PVF, PWF2. For properties of Ushar part of PWF2, see Ushar series.	>5	>60	B	0–8 8–60	Cobbly loam, very cobbly loam, or gravelly loam. Very gravelly loam or very gravelly sandy loam.	SM or ML GM	A–4 A–2 or A–1	0–25 15–30
Poganeab: PxB, PyB	0–2½	>60	C	0–60	Clay loam, silty clay loam, or clay.	CL	A–6	0
*Red Butte: RBG2, RCG2, RDG2, REG2, RFF2, RGF2. For properties of McQuarrie part of RDG2, see McQuarrie series; for properties of Deer Creek part of REG2, see Deer Creek series; for properties of Flowell part of RFF2, see Flowell series; for properties of Phage part of RGF2, see Phage series.	>5	>60	B	0–8 8–16 16–60	Very cobbly loam or cobbly loam. Cobbly clay loam Very cobbly sandy loam or loam.	GC, GM–GC, or GM GC GM–GC, GC	A–2 A–2 or A–6 or A–7 A–2 or A–1	35–50 25–40 30–40

significant in engineering—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							
						Inches per hour	*Inches per inch of soil*	*pH*		
100	90–100	80–90	70–80	20–30	NP–10	0.6–2.0	0.11–0.14	6.6–8.4	Low	Moderate.
85–95	80–90	75–85	50–70	20–30	NP–10	0.6–2.0	0.14–0.16	7.9–9.0	Low	Moderate.
90–100	85–100	70–90	40–60	15–25	5–10	0.6–2.0	0.11–0.14	7.9–9.9	Low	Moderate.
80–100	75–95	70–90	60–80	25–40	10–20	0.6–2.0	0.16–0.2	7.4–9.0	Moderate	Moderate.
80–100	70–90	65–85	50–75	25–40	5–15	0.2–0.6	0.08–0.14	7.4–7.8	Moderate	Moderate.
80–90	75–85	65–80	50–70	25–40	5–15	0.6–2.0	0.10–0.17	7.4–8.4	Moderate	Moderate.
100	100	90–100	85–95	20–30	5–15	0.2–0.6	0.17–0.19	8.5–9.2	Moderate	Moderate.
70–90	60–80	45–70	40–60	20–30	NP–4	2.0–6.0	0.10–0.13	7.9–8.4	Low	Moderate.
40–60	35–50	20–40	15–35	15–25	NP–4	2.0–6.0	0.06–0.08	7.9–9.0	Low	Low.
70–90	60–80	45–70	40–60	20–30	NP–4	0.6–2.0	0.12–0.13	7.9–9.0	Low	Moderate.
40–60	35–50	20–40	15–35	15–25	NP–4	2.0–6.0	0.06–0.08	7.9–9.0	Low	Low.
100	100	90–100	80–95	30–40	10–20	0.06–0.2	0.18–0.2	7.9–9.0	High	High.
25–50	20–45	15–40	15–35	20–30	NP–10	0.6–2.0	0.09–0.1	7.9–8.4	Moderate	Moderate.
50–60	45–55	45–50	30–45	30–60	20–35	0.6–2.0	0.14–0.15	7.9–8.4	Moderate	Moderate.
35–55	30–50	20–40	15–35	25–35	5–10	0.6–2.0	0.07–0.10	8.4–9.0	Low	Moderate.

TABLE 3.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock or hardpan	Hydrologic group	Depth from surface	Classification			Coarse fraction greater than 3 inches
					USDA texture	Unified	AASHO	
	Feet	*Inches*		*Inches*				*Percent*
*Red Rock: RhB For properties of Phage part of this unit, see Phage series.	>5	>60	B	0–60	Heavy silt loam or silty clay loam.	CL	A–6	0
Riverwash: RK Properties are too variable to be estimated.	>5	>60						
Rob Roy: RLE, RMF, RNF	>5	20–36	C	0–8	Very cobbly loam or loam.	GM or ML	A–2 or A–4	0–40
				8–19	Light clay	CH or CL	A–6 or A–7	0
				19–31	Cobbly clay loam	GC or CL	A–6	20–30
Rock land: RO Properties are too variable to be estimated.	>5	0–10						
Shale outcrop: Properties are too variable to be estimated.	>5	0						
*Sheeprock: SCC, SDF, SEF, SFF. For properties of Cokel part of SEF, see Cokel series; for properties of Ushar part of SFF, see Ushar series. Properties of Shale outcrop part of SFF are too variable to be estimated.	>5	>60	A	0–60	Stratified coarse sand, very gravelly coarse sand, and coarse sandy loam.	GM, GP–GM	A–1	0
Shotwell: SHF	>5	10–20	D	0–12	Very cobbly loam or loam.	ML or GM, SM	A–4	10–30
				12	Unweathered bedrock.			
Sigurd: SKE	>5	>60	B	0–11	Gravelly loam	GM–GC or GC, CL–ML or CL	A–4 or A–6	10–25
				11–60	Very gravelly sandy loam.	GM, GP–GM	A–1	0–30
*Snake Hollow: SLD, SLD2, SNE3, SOD. For properties of Blackett part of SNE3, see Blackett series; for properties of Blue Star part of SOD, see Blue Star series.	>5	>60	B	0–35	Coarse sandy loam	SM, SM–SC or SC	A–2	0–5
				35–60	Fine gravel and sand	SP–SM, GP–GM	A–1	0–10
Snake Hollow variant: SRF	>5	20–36	B	0–30	Very cherty loam, very cherty heavy sandy clay loam, or very cherty clay loam.	GM–GC or GC	A–2	10–30
				30	Bedrock.			

significant in engineering—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							
						Inches per hour	*Inches per inch of soil*			
100	100	90–100	85–95	30–40	10–15	0.6–2.0	0.17–0.2	7.4–8.4	Moderate	High.
45–80	40–75	35–70	25–55	20–30	NP–4	0.6–2.0	0.09–0.17	7.4–8.4	Low	Moderate.
95–100	90–100	75–90	70–85	35–55	15–30	0.06–0.2	0.18–0.2	7.4–8.4	Moderate	Moderate.
65–85	60–80	55–80	40–60	30–40	10–20	0.2–0.6	0.15–0.16	7.4–8.4	Low	Moderate.
35–55	30–45	10–40	5–15	20–25	NP	6.0–20	0.05–0.07	7.9–9.0	Low	Low.
65–85	60–75	55–70	45–55	30–35	NP–4	0.6–2.0	0.12–0.15	7.9–8.4	Moderate	Moderate.
50–70	60–80	50–75	40–60	20–30	5–15	2.0–6.0	0.11–0.12	7.9–8.4	Low	Moderate.
25–40	20–35	10–30	5–15	20–25	NP–4	2.0–6.0	0.05–0.06	7.9–8.4	Low	Low.
85–100	55–95	30–60	10–30	20–30	NP–10	2.0–6.0	0.10–0.13	7.9–9.0	Low	Moderate.
50–75	45–70	15–30	5–10	20–25	NP	2.0–6.0	0.04–0.06	7.9–9.0	Low	Low.
40–50	35–50	30–40	20–30	20–30	6–15	0.6–2.0	0.08–0.1	7.4–7.8	Low	Low.

TABLE 3.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth to bedrock or hardpan	Hydrologic group	Depth from surface	Classification			Coarse fraction greater than 3 inches
					USDA texture	Unified	AASHO	
	Feet	*Inches*		*Inches*				*Percent*
*Ushar: UAD2, UHC3, UHD, UHD2, ULF2, UMF2, UND, UOD2, UOF2, URF, USF, UTF2, UTG2. For properties of Etta part of UND, see Etta series; for properties of Mill Hollow part of UOD2 and UOF2, see Mill Hollow series; for properties of Mosida part of URF, see Mosida series; for properties of Murdock part of USF, see Murdock series; for properties of Phage part of UTF2 and UTG2, see Phage series.	>5	>60	B	0–31	Loam, cobbly loam, or light clay loam.	CL–ML or CL	A–4 or A–6	0–30
				31–60	Gravelly sandy loam and coarse sand and gravel.	GP–GM or GM	A–1	0–30
Ushar variant: Parts of FIB, and FMC2. Mapped only in association with Flowell soils.	>5	>60	C	0–9	Silt loam or loam	CL–ML or ML	A–4	0
				9–60	Clay loam or gravelly clay loam.	CL	A–6	5–10
*Wallsburg: WBG2, WCG2, WMG2. For properties of Maple Mountain part of WMG2, see Maple Mountain series.	>5	10–20	D	0–19	Very cobbly loam and clay.	CL	A–6	35–50
				19	Unweathered bedrock.			
Wet alluvial land: Wt. Properties are too variable to be estimated.	1–2½	>60						
*Yardley:								
YAC, YME	>5	>60	C	0–10	Loam	CL–ML or CL	A–4 or A–6	0
				10–60	Heavy clay loam or light clay or loam.	CL	A–6 or A–7	0
YMF. For properties of Wallsburg part of this unit, see Wallsburg series.	>5	40–60	C	0–10	Loam	CL–ML or CL	A–4 or A–6	0
				10–40	Heavy clay loam or light clay or loam.	CL	A–6 or A–7	0
				40	Unweathered bedrock.			

[1] NP means nonplastic.

significant in engineering—Continued

Percentage passing sieve—				Liquid limit	Plasticity index	Permeability	Available water capacity	Reaction	Shrink-swell potential	Susceptibility to frost action
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)			*Inches per hour*	*Inches per inch of soil*	*pH*		
80–95	75–90	70–85	55–70	25–35	5–15	0.6–2.0	0.15–0.2	7.4–9.0	Moderate	Moderate.
35–50	25–40	15–25	5–20	20–30	NP–4	2.0–6.0	0.06–0.1	7.9–9.0	Low	Low.
85–100	80–100	70–80	50–60	25–35	5–10	0.6–2.0	0.18–0.2	6.6–7.8	Low	Moderate.
70–90	65–80	60–75	50–65	25–35	10–20	0.2–0.6	0.16–0.17	6.6–7.8	Moderate	Moderate.
75–85	70–80	65–75	50–60	25–35	10–15	0.6–2.0	0.09–0.1	6.6–7.3	Moderate	Moderate.
80–100	80–95	65–90	50–65	25–40	5–15	0.6–2.0	0.17–0.18	6.6–7.8	Slight	Moderate.
90–100	80–90	60–70	50–60	30–45	15–25	0.06–0.2	0.18–0.20	6.6–7.8	Moderate	Moderate.
80–100	80–95	65–90	50–65	25–40	5–15	0.6–2.0	0.17–0.18	6.6–7.8	Slight	Moderate.
90–100	80–90	60–70	50–60	30–45	15–25	0.06–0.2	0.18–0.20	6.6–7.8	Moderate	Moderate.

TABLE 4.—*Interpretations of engineering*

[The asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. carefully the instructions for referring to other

Soil series and map symbols	Suitability as a source of—				Soil features affecting—
	Topsoil	Sand	Gravel	Road fill	Farm pond reservoir areas
Alovar: ALD3	Fair: too clayey	Not suitable	Not suitable	Poor: low strength. Fair in areas of moderate potential frost action.	Moderately slow permeability; slopes of 3 to 10 percent.
*Antelope Springs: AND2. For Kessler part of this unit, see Kessler series.	Poor: strongly saline-alkali.	Not suitable	Not suitable	Fair: low strength; moderate potential frost action.	Slow permeability; slopes of 1 to 3 percent.
Antelope Springs variant: AS.	Poor: strongly saline-alkali.	Not suitable	Not suitable	Fair: low strength; moderate potential frost action.	Slow permeability; slopes of 1 to 3 percent.
*Bearskin: BCF2, BEF. For Cowers part of these units, see Cowers series.	Poor: too gravelly	Not suitable	Not suitable	Poor: bedrock at a depth of 10 to 20 inches.	Slopes of 2 to 30 percent; bedrock at a depth of 10 to 20 inches.
*Blackett: BKE, BLE, BNE2. For Blue Star part of BLE and Snake Hollow part of BNE2, see Blue Star and Snake Hollow series.	Fair: thin layer	Not suitable	Not suitable	Fair: low strength; moderate potential frost action.	Slopes of 3 to 20 percent.
Black Ridge: BRF	Poor: too cobbly	Not suitable	Not suitable	Poor: low strength; hardpan at a depth of 14 to 20 inches. Fair in areas of moderate potential frost action.	Slopes of 6 to 30 percent; hardpan at a depth of 14 to 20 inches.
Blue Star: BSD	Poor: too cobbly	Poor	Not suitable	Fair: moderate potential frost action.	Moderately rapid permeability; slopes of 3 to 10 percent.
Chipman: Ca	Fair: too clayey; water table at a depth of 10 to 30 inches.	Not suitable	Not suitable	Poor: low strength; high potential frost action.	Slow permeability; slopes of 1 to 3 percent.
Clegg: CEF, CGF, CLF.	Good	Not suitable	Not suitable	Fair: moderate potential frost action.	Moderately slow permeability; slopes of 6 to 30 percent.

properties of the soils

The soils in such mapping units may have different properties and limitations, and for this reason it is necessary to follow series that appear in the first column of this table]

Soil features affecting—Con.			Degree and kind of limitations for—		
Farm pond embankments	Drainage for crops and pasture	Irrigation	Dwellings	Septic tank absorption fields	Local roads and streets
Low shear strength; fair to poor compaction characteristics.	Not needed	Moderately slow permeability; slopes of 3 to 10 percent.	Moderate: moderate potential frost action; low strength.	Severe: moderately slow permeability.	Severe: low strength. Moderate in areas of moderate potential frost action.
High piping hazard; fair compaction characteristics.	Drainage difficult; alkali soil.	Strongly saline-alkali; slow permeability.	Moderate: moderate potential frost action.	Moderate: moderate permeability in lower part.	Moderate: low strength; moderate potential frost action.
High piping hazard; fair compaction characteristics.	Drainage difficult; alkali soil.	Strongly saline-alkali; slow permeability.	Moderate: moderate potential frost action.	Moderate: moderate permeability in lower part.	Moderate: low strength; moderate potential frost action.
Bedrock at a depth of 10 to 20 inches.	Not needed	Bedrock at a depth of 10 to 20 inches; slopes of 2 to 30 percent.	Severe: granite bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 2 to 30 percent.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 2 to 30 percent.
Medium piping hazard and shear strength.	Not needed	Slopes of 3 to 20 percent.	Moderate where slopes are 3 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 20 percent.	Moderate where slopes are 3 to 15 percent: moderate permeability. Severe where slopes are 15 to 20 percent.	Moderate: low strength; moderate potential frost action.
Slopes of 6 to 30 percent; hardpan at a depth of 14 to 20 inches; bedrock at a depth of 30 inches.	Not needed	Hardpan at a depth of 14 to 20 inches.	Severe: hardpan at a depth of 14 to 20 inches; slopes of 6 to 30 percent.	Severe: hardpan at a depth of 14 to 20 inches; slopes of 6 to 30 percent.	Severe: hardpan at a depth of 14 to 20 inches; slopes of 6 to 30 percent. Moderate in areas of moderate potential frost action.
Medium piping hazard; medium shear strength.	Not needed	Uneven topography; erodible.	Moderate: moderate potential frost action; slopes of 3 to 10 percent.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 10 percent.	Moderate: slopes of 3 to 10 percent; moderate potential frost action.
Water table at a depth of 1 to 30 inches; low shear strength.	Slow permeability; poor outlets.	Slow permeability; water table at a depth of 10 to 30 inches.	Severe: water table at a depth of 10 to 30 inches; high potential frost action.	Severe: water table at a depth of 10 to 30 inches; slow permeability.	Severe: low strength; high potential frost action.
Medium to high piping hazard; medium shear strength.	Not needed	Slopes of 6 to 30 percent; cobbles on surface in some places.	Moderate where slopes are 6 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 30 percent.	Severe: slopes of 6 to 30 percent; moderately slow permeability.	Moderate where slopes are 6 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 30 percent.

TABLE 4.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—				Soil features affecting—
	Topsoil	Sand	Gravel	Road fill	Farm pond reservoir areas
Cokel: CME	Poor: too cobbly	Fair below a depth of 24 inches.	Fair below a depth of 24 inches.	Good	Rapid permeability below a depth of 22 inches; slopes of 3 to 20 percent.
*Colluvial land: CN. For Shale outcrop part of this unit, see Shale outcrop.	Too variable to be rated.	Too variable to be rated.	Too variable to be rated.	Too variable to be rated.	Steep slopes
*Cowers: COF2, CRF2, CSF2. For Bearskin part of CSF2, see Bearskin series.	Fair: too gravelly	Not suitable	Not suitable	Good	Moderate permeability; slopes of 2 to 30 percent.
*Decca: DaC, DCF, DeB, DeC, DFD, DHF. For Hiko Peak part of DHF, see Hiko Peak series.	Poor: thin layer	Poor below a depth of 15 inches after sieving.	Good below a depth of 15 inches.	Good	Rapid permeability below a depth of 15 inches; slopes of 1 to 30 percent.
Deer Creek: DKF2, DLE2.	Poor: too cobbly	Not suitable	Not suitable	Fair: moderate potential frost action; low strength.	Slow permeability; slopes of 3 to 50 percent.
Draper: DrB	Good: water table below a depth of 20 inches.	Fair below a depth of 48 inches after sieving: water table below a depth of 20 inches.	Fair below a depth of 48 inches: water table below a depth of 20 inches.	Poor: high potential frost action in materials in upper 48 inches. Good below a depth of 48 inches.	Rapid permeability below a depth of 48 inches.
Draper variant: Ds	Fair: thin layer	Fair below a depth of 15 inches after sieving: water table below a depth of 15 inches.	Fair below a depth of 15 inches: water table below a depth of 15 inches.	Good	Rapid permeability below a depth of 25 inches.

properties of the soils—Continued

Soil features affecting—Con.			Degree and kind of limitations for—		
Farm pond embankments	Drainage for crops and pasture	Irrigation	Dwellings	Septic tank absorption fields	Local roads and streets
High compacted permeability below a depth of 22 inches.	Not needed	Cobbly or gravelly; low available water capacity; slopes of 3 to 20 percent.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 20 percent.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 20 percent.	Moderate where slopes are 3 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 20 percent.
Too variable to be rated.	Not needed	Steep	Severe: steep	Severe: steep	Severe: steep.
Medium piping hazard; medium shear strength.	Not needed	Moderate permeability; slopes of 2 to 30 percent.	Slight where slopes are 2 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Slight where slopes are 2 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Moderate where slopes are 2 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 30 percent.
High compacted permeability; medium piping hazard.	Not needed	Very gravelly soil material at a depth of 1 foot; low water holding capacity; rapid permeability below a depth of 15 inches.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent: pollution may be a hazard near streams.	Moderate where slopes are 1 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 30 percent.
Medium piping hazard; medium shear strength.	Not needed	Slow permeability; cobbly; slopes of 3 to 50 percent.	Moderate where slopes are 3 to 15 percent: moderate shrink-swell potential; moderate potential frost action. Severe where slopes are 15 to 50 percent.	Severe: slow permeability; slopes of 3 to 50 percent.	Moderate where slopes are 3 to 15 percent: moderate potential frost action; moderate shrink-swell potential. Severe where slopes are 15 to 50 percent.
Medium to high piping hazard; medium shear strength.	Rapid permeability below a depth of 48 inches; water table at a depth of 30 to 40 inches.	Water table at a depth of 30 to 40 inches; gravelly soil material at a depth of 48 inches.	Severe: water table at a depth of 30 to 40 inches; high potential frost action.	Severe: water table at a depth of 30 to 40 inches.	Severe: high potential frost action; water table at a depth of 30 to 40 inches.
Medium to high piping hazard; medium shear strength.	Rapid permeability below a depth of 48 inches; water table at a depth of 15 to 30 inches; poor outlets.	Gravelly soil material at a depth of 25 inches; water table at a depth of 15 to 30 inches.	Severe: water table at a depth of 15 to 30 inches; high potential frost action.	Severe: water table at a depth of 15 to 30 inches.	Severe: high potential frost action; water table at a depth of 15 to 30 inches.

TABLE 4.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—				Soil features affecting—
	Topsoil	Sand	Gravel	Road fill	Farm pond reservoir areas
*Escalante: ECD2, ESD2. For Hiko Peak part of ESD2, see Hiko Peak series.	Fair: thin layer	Poor	Not suitable	Fair: low strength; moderate potential frost action.	Moderate permeability; slopes of 2 to 10 percent.
Etta: Et	Fair: too clayey	Not suitable	Not suitable	Fair: moderate potential frost action; low strength.	Moderately slow permeability; slopes of 1 to 3 percent.
Etta variant: Ev	Poor: too clayey	Not suitable	Not suitable	Poor: high shrink-swell potential; low strength; moderate potential frost action.	Slow permeability; slopes of 1 to 3 percent.
*Firmage: FDF For Oakden part of this unit, see Oakden series.	Poor: too cobbly	Not suitable	Not suitable	Fair: moderate potential frost action; low strength.	Moderate permeability; slopes of 5 to 30 percent.
*Flowell: FEC2, FGC2, FIB, FMC2, FUF. For Ushar part of FUF, see Ushar series.	Fair: too clayey Poor: too gravelly or cobbly.	Not suitable	Not suitable	Fair: moderate potential frost action; low strength.	Slow permeability; slopes of 1 to 30 percent.
Flowell variant: FVF2, FWG2.	Poor: too cobbly	Not suitable	Not suitable	Fair: low strength; moderate potential frost action.	Slopes of 10 to 60 percent.
Fruitland: FxB, FxC, FZC2.	Good	Not suitable	Not suitable	Fair: moderate potential frost action; low strength.	Moderate permeability; slopes of 1 to 6 percent.
Hansel: HAB	Fair: too clayey	Not suitable	Not suitable	Poor: low strength. Fair in areas of moderate potential frost action.	Slow permeability; slopes of 1 to 3 percent.
Hansel, low lime variant: He.	Fair: thin layer	Not suitable	Not suitable	Poor: low strength; moderate potential frost action.	Moderately slow permeability; slopes of 1 to 3 percent.

properties of the soils—Continued

Soil features affecting—Con.			Degree and kind of limitations for—		
Farm pond embankments	Drainage for crops and pasture	Irrigation	Dwellings	Septic tank absorption fields	Local roads and streets
Medium piping hazard; medium shear strength.	Not needed	Moderate permeability; moderate water holding capacity; slopes of 2 to 10 percent.	Moderate: moderate potential frost action.	Slight where slopes are 2 to 8 percent. Moderate where slopes are 8 to 10 percent.	Moderate: low strength; moderate potential frost action.
High piping hazard; medium shear strength.	Not needed	Moderately slow permeability.	Moderate: moderate potential frost action; low strength.	Severe: moderately slow permeability.	Moderate: moderate potential frost action; low strength.
Low shear strength; medium compressibility.	Not needed	Slow permeability	Severe: high shrink-swell potential; moderate potential frost action; low strength.	Severe: slow permeability.	Severe: low strength; high shrink-swell potential; moderate potential frost action.
Medium piping hazard; medium shear strength.	Not needed	Cobbly; moderate available water capacity; slopes of 5 to 30 percent.	Moderate where slopes are 5 to 15 percent: moderate potential frost action; low strength. Severe where slopes are 15 to 30 percent.	Moderate where slopes are 5 to 15 percent: moderate permeability. Severe where slopes are 15 to 30 percent.	Moderate where slopes are 5 to 15 percent: moderfrost action; low strength. Severe where slopes are 15 to 30 percent.
Medium piping hazard; low to medium shear strength.	Not needed	Slow permeability; cobbly in most places; slopes of 1 to 30 percent.	Severe: high shrink-swell potential; slopes of 1 to 30 percent; low strength.	Severe: slow permeability; slopes of 1 to 30 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action; low strength. Severe where slopes are 15 to 30 percent: high shrink-swell potential.
Very cobbly; medium piping hazard.	Not needed	Slow permeability; cobbly; slopes of 10 to 60 percent.	Severe: high shrink-swell potential; slopes of 10 to 60 percent.	Severe: slopes of 10 to 60 percent.	Moderate where slopes are 10 to 15 percent: low strength; moderate potential frost action. Severe where slopes are 15 to 60 percent.
Medium to high piping hazard; medium shear strength.	Not needed	Moderate permeability; slopes of 1 to 6 percent.	Moderate: moderate potential frost action; low strength.	Slight	Moderate: moderate potential frost action; low strength.
Low shear strength; medium compressibility.	Not needed	Slow permeability; slopes of 1 to 3 percent.	Moderate: moderate potential frost action; low strength.	Severe: slow permeability.	Severe: low strength. Moderate in areas of moderate potential frost action.
Low to medium shear strength; low to medium piping hazard.	Not needed	Moderately slow permeability; slopes of 1 to 3 percent.	Moderate: moderate potential frost action; low strength.	Severe: moderately slow permeability.	Severe: low strength; moderate potential frost action.

TABLE 4.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—				Soil features affecting—
	Topsoil	Sand	Gravel	Road fill	Farm pond reservoir areas
Haybourne: HHD	Poor: too gravelly	Fair below a depth of 30 inches.	Not suitable	Fair: moderate potential frost action.	Rapid permeability below a depth of 48 inches; slopes of 1 to 10 percent.
Hiko Peak: HIF, HKD, HPE, HRE. For Decca part of HPE and Fruitland part of HRE, see Decca and Fruitland series.	Poor: too cobbly	Fair below a depth of 20 inches.	Fair below a depth of 20 inches.	Good	Rapid permeability below a depth of 34 inches; slopes of 1 to 30 percent.
James Canyon: JcB, JeB.	Poor for JeB: wet Poor for JcB: saline; wet.	Not suitable	Not suitable	Poor: water table at a depth of 0 to 30 inches; high potential frost action.	Moderately slow permeability; slopes of 1 to 3 percent.
James Canyon, calcareous variant: Jm.	Good	Not suitable	Not suitable	Poor: water table at a depth of 24 to 36 inches; high potential frost action.	Moderate permeability; slopes of 1 to 3 percent.
James Canyon, heavy variant: Jn, Jo.	Poor: wet	Not suitable	Not suitable	Poor: water table at a depth of 0 to 20 inches; high potential frost action; low strength.	Slow permeability; slopes of 1 to 3 percent.
Kersick: KCF	Poor: too cobbly	Not suitable	Not suitable	Poor: bedrock at a depth of 10 to 20 inches. Fair: low strength.	Bedrock at a depth of 10 to 20 inches; slopes of 5 to 30 percent.
*Kessler: KED, KLE, KME, KPE. For Hiko Peak part of KME and Penoyer part of KPE, see Hiko Peak and Penoyer series.	Poor: too cobbly	Not suitable	Not suitable	Poor: low strength. Fair in areas of moderate potential frost action.	Moderate permeability; slopes of 1 to 20 percent.
Manderfield: MaB, MaC, MBB2, McB, MdB, MeC, MFC2.	Fair for MaB, MaC, MBB2, and McB: too clayey. Poor for MdB, MeC, MFC2: too gravelly or cobbly.	Fair to poor below a depth of 24 inches after sieving.	Good to fair below a depth of 24 inches.	Good	Very rapid to rapid permeability below a depth of 24 inches; slopes of 1 to 30 percent.

properties of the soils—Continued

Soil features affecting—Con.			Degree and kind of limitations for—		
Farm pond embankments	Drainage for crops and pasture	Irrigation	Dwellings	Septic tank absorption fields	Local roads and streets
Medium shear strength; medium to low piping hazard.	Not needed	Moderate permeability; moderate available water capacity: slopes of 1 to 10 percent.	Moderate: moderate potential frost action; slopes of 1 to 10 percent.	Slight where slopes are 1 to 8 percent. frost action; slopes. Moderate where slopes are 8 to 10 percent.	Moderate: moderate potential frost action.
Medium to high compacted permeability; medium piping hazard.	Not needed	Cobbly or gravelly; low water holding capacity; slopes of 1 to 30 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.
Medium piping hazard; medium strength.	Moderately slow permeability; poor outlets.	Moderately slow permeability; water table at a depth of 0 to 30 inches.	Severe: water table at a depth of 0 to 30 inches; high potential frost action.	Severe: water table at a depth of 0 to 30 inches.	Severe: high potential frost action; water table at a depth of 0 to 30 inches.
Medium piping hazard; medium strength.	Moderate permeability; poor outlets.	Moderate permeability; water table at a depth of 24 to 36 inches.	Severe: water table at a depth of 24 to 36 inches; high potential frost action.	Severe: water table at a depth of 24 to 36 inches.	Severe: high potential frost action; water table at a depth of 24 to 36 inches.
Moderate to high shrink-swell potential; low shear strength.	Slow permeability; poor outlets.	Slow permeability; water table at a depth of 0 to 20 inches.	Severe: water table at a depth of 0 to 20 inches; high potential frost action.	Severe: water table at a depth of 0 to 20 inches; slow permeability.	Severe: high potential frost action; water table at a depth of 0 to 20 inches; low strength.
Bedrock at a depth of 10 to 20 inches.	Not needed	Bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 5 to 30 percent.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 5 to 30 percent.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 5 to 30 percent.
Medium to high piping hazard; low shear strength; poor compaction characteristics.	Not needed	Very cobbly surface; slopes of 1 to 20 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action; low strength. Severe where slopes are 15 to 20 percent.	Moderate where slopes are 1 to 15 percent: moderate permeability. Severe where slopes are 15 to 20 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 20 percent.
High to medium permeability in compacted material.	Not needed	Low water holding capacity; gravelly soil material at a depth of 24 inches.	Slight	Slight [1]	Moderate where slopes are 1 to 15 percent: mod- ate potential frost action. Severe where slopes are 15 to 30 percent slopes.

TABLE 4.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—				Soil features affecting—
	Topsoil	Sand	Gravel	Road fill	Farm pond reservoir areas
Maple Mountain: MGG.	Poor: too cobbly	Not suitable	Not suitable	Fair where slopes are 10 to 25 percent: moderate potential frost action. Poor where slopes are 25 to 50 percent: low strength.	Moderately slow permeability; slopes of 10 to 50 percent.
*May Day: MHG, MIE. For Deer Creek part of MIE, see Deer Creek series.	Poor: too cobbly	Not suitable	Not suitable	Poor: hardpan at a depth of 15 to 20 inches.	Hardpan at a depth of 15 to 20 inches; slopes of 3 to 30 percent.
McQuarrie: MKF	Poor: too cobbly	Not suitable	Not suitable	Poor: bedrock at a depth of 12 to 20 inches.	Bedrock at a depth of 12 to 20 inches; slopes of 3 to 30 percent.
McQuarrie, variant: MLF.	Poor: too cobbly	Not suitable	Not suitable	Poor: bedrock at a depth of 10 to 18 inches.	Bedrock at a depth of 10 to 18 inches; slopes of 5 to 60 percent.
*Mill Hollow: MMD, MNF, MOF. For Pharo part of MNF and Ushar part of MOF, see Pharo and Ushar series.	Poor: too cobbly	Not suitable	Not suitable	Poor: low strength. Fair in areas of moderate potential frost action.	Moderate permeability; slopes of 3 to 30 percent.
*Mineral Mountain: MPG, MRG2. For Snake Hollow part of MRG2, see Snake Hollow series.	Poor: too cobbly	Not suitable	Not suitable	Poor: low strength; slopes of 30 to 60 percent. Fair in areas of moderate potential frost action.	Slow permeability; slopes of 30 to 60 percent.
Mineral Mountain, gravelly subsoil variant: MSE, MSG2.	Poor: too cobbly	Not suitable	Not suitable	Fair where slopes are 2 to 25 percent: moderate potential frost action. Poor where slopes are 25 to 60 percent: low strength.	Moderately slow permeability; slopes of 2 to 60 percent.
Mineral Mountain, noncalcareous variant. Mapped only in an association with Cowers soils.	Poor: too gravelly	Poor below a depth of 36 inches.	Not suitable	Fair: moderate potential frost action.	Moderately rapid permeability below a depth of 21 inches; slopes of 2 to 30 percent.

properties of the soils—Continued

Soil features affecting—Con.			Degree and kind of limitations for—		
Farm pond embankments	Drainage for crops and pasture	Irrigation	Dwellings	Septic tank absorption fields	Local roads and streets
Medium piping hazard; medium shear strength.	Not needed	Cobbly; slopes of 10 to 50 percent.	Moderate where slopes are 10 to 15 percent: moderate potential frost action; low strength. Severe where slopes are 15 to 50 percent.	Severe: moderately slow permeability; slopes of 10 to 50 percent.	Moderate where slopes are 10 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 50 percent.
Hardpan at a depth of 15 to 20 inches.	Not needed	Very cobbly; hardpan at a depth of 15 to 20 inches; slopes of 3 to 30 percent.	Severe: hardpan at a depth of 15 to 20 inches; slopes of 3 to 30 percent.	Severe: hardpan at a depth of 15 to 20 inches; slopes of 3 to 30 percent.	Severe: hardpan at a depth of 15 to 20 inches; slopes of 3 to 30 percent.
Bedrock at a depth of 12 to 20 inches.	Not needed	Very cobbly; bedrock at a depth of 12 to 20 inches.	Severe: bedrock at a depth of 12 to 20 inches; slopes of 3 to 30 percent.	Severe: bedrock at a depth of 12 to 20 inches; slopes of 3 to 30 percent.	Severe: bedrock at a depth of 12 to 20 inches; slopes of 3 to 30 percent.
Bedrock at a depth of 10 to 18 inches.	Not needed	Very cobbly; bedrock at a depth of 10 to 18 inches.	Severe: bedrock at a depth of 10 to 18 inches; slopes of 5 to 60 percent.	Severe: bedrock at a depth of 10 to 18 inches; slopes of 5 to 60 percent.	Severe: bedrock at a depth of 10 to 18 inches; slopes of 5 to 60 percent.
Medium to low shear strength; medium to high piping hazard; poor to fair compaction characteristics.	Not needed	Moderate permeability; moderate available water capacity; slopes of 3 to 30 percent.	Moderate where slopes are 3 to 15 percent: low strength; moderate potential frost action. Severe where slopes are 15 to 30 percent.	Moderate where slopes are 3 to 15 percent; moderate permeability. Severe where slopes are 15 to 30 percent.	Moderate where slopes are 3 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 30 percent: low strength.
Slopes of 30 to 60 percent; medium to high piping hazard.	Not needed	Slow permeability; slopes of 30 to 60 percent.	Severe: slopes of 30 to 60 percent. Moderate in areas of moderate potential frost action; low strength.	Severe: slow permeability; slopes of 30 to 60 percent.	Severe: low strength; slopes of 30 to 60 percent. Moderate in areas of moderate potential frost action.
Very cobbly; medium piping hazard; medium shear strength.	Not needed	Very cobbly; slopes of 2 to 60 percent.	Moderate where slopes are 2 to 15 percent: low strength; moderate potential frost action. Severe where slopes are 15 to 60 percent.	Severe: slopes of 2 to 60 percent; moderately slow permeability.	Moderate where slopes are 2 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 60 percent: low strength.
Medium piping hazard; medium shear strength.	Not needed	Moderately slow permeability; slopes of 2 to 30 percent.	Moderate where slopes are 2 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 30 percent.	Slight where slopes are 2 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Moderate where slopes are 2 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 30 percent.

TABLE 4.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—				Soil features affecting—
	Topsoil	Sand	Gravel	Road fill	Farm pond reservoir areas
Mine wash: MT	Poor: extremely acid.	Not suitable	Not suitable	Poor: low strength. Fair in areas of moderate potential frost action.	Moderately slow permeability.
Mosida: MuB, MuC, MuC2, MVC3, MwC.	Good	Not suitable	Not suitable	Fair: moderate potential frost action; low strength.	Moderate permeability; slopes of 1 to 6 percent.
Mud Springs: MXF	Poor: too cobbly	Not suitable	Not suitable	Poor: bedrock at a depth of 24 to 36 inches; slopes of 30 to 40 percent.	Slopes of 30 to 40 percent.
*Murdock: MYB, MZF2. For Flowell part of MZF2, see Flowell series.	Fair: thin layer	Not suitable	Not suitable	Poor: hardpan at a depth of 20 to 36 inches. Fair in areas of moderate potential frost action.	Moderate permeability; hardpan at a depth of 20 to 36 inches.
Oakden. Mapped only in an association with Firmage soils.	Poor: thin layer; too cobbly.	Not suitable	Not suitable	Poor: hardpan at a depth of 6 to 12 inches.	Hardpan at a depth of 6 to 12 inches; slopes of 5 to 30 percent.
Oasis: OAB	Poor: alkali affected.	Not suitable	Not suitable	Fair: moderate potential frost action; low strength.	Moderate permeability; slopes of 1 to 3 percent.
Paice: PAD	Poor: too cobbly	Not suitable	Not suitable	Poor: hardpan at a depth of 30 to 40 inches. Fair in areas of moderate potential frost action.	Moderate permeability; hardpan at a depth of 30 to 40 inches; slopes of 3 to 10 percent.
Pass Canyon: PBF3, PCF2.	Poor: too cobbly	Not suitable	Not suitable	Poor: bedrock at a depth of 5 to 20 inches.	Bedrock at a depth of 5 to 20 inches; slopes of 3 to 30 percent.
Pavant: PdB, PEC, PFG.	Poor: too cobbly	Not suitable	Not suitable	Poor: hardpan at a depth of 11 to 20 inches; slopes of 1 to 40 percent.	Hardpan at a depth of 11 to 20 inches; slopes of 1 to 40 percent.
*Penoyer: PGB, PHD. For Hiko Peak part of PHD, see Hiko Peak series.	Good	Not suitable	Not suitable	Fair: moderate potential frost action; low strength.	Moderately slow permeability; slopes of 1 to 3 percent.

properties of the soils—Continued

Soil features affecting—Con.			Degree and kind of limitations for—		
Farm pond embankments	Drainage for crops and pasture	Irrigation	Dwellings	Septic tank absorption fields	Local roads and streets
Low shear strength; fair compaction characteristics.	Not needed	Extremely acid	Severe: low strength; moderate potential frost action.	Severe: moderately slow permeability.	Severe: low strength. Moderate in areas of moderate potential frost action.
High piping hazard; poor compaction characteristics; low shear strength.	Not needed	Moderate permeability; slopes of 1 to 6 percent.	Moderate: moderate potential frost action; low strength.	Moderate: moderate permeability.	Moderate: low strength; moderate potential frost action.
Bedrock at a depth of 24 to 36 inches.	Not needed	Cobbly; slopes of 30 to 40 percent; bedrock at a depth of 24 to 36 inches.	Severe: bedrock at a depth of 24 to 36 inches; slopes of 30 to 40 percent.	Severe: bedrock at a depth of 24 to 36 inches; slopes of 30 to 40 percent.	Severe: bedrock at a depth of 24 to 36 inches; slopes of 30 to 40 percent.
Hardpan at a depth of 20 to 36 inches.	Not needed	Hardpan at a depth of 20 to 36 inches; low water holding capacity.	Severe: hardpan at a depth of 20 to 36 inches. Moderate in areas of moderate potential frost action.	Severe: hardpan at a depth of 20 to 36 inches.	Severe: hardpan at a depth of 20 to 36 inches. Moderate in areas of moderate potential frost action.
Hardpan at a depth of 6 to 12 inches.	Not needed	Hardpan at a depth of 6 to 12 inches; slopes of 5 to 30 percent.	Severe: hardpan at a depth of 6 to 12 inches; slopes of 5 to 30 percent.	Severe: slopes of 5 to 30 percent; hardpan at a depth of 6 to 12 inches.	Severe: hardpan at a depth of 6 to 12 inches; slopes of 5 to 30 percent.
Medium piping hazard; medium shear strength.	Not needed	Alkali affected; moderate permeability; moderate available water capacity; slopes of 1 to 3 percent.	Moderate: moderate potential frost action.	Moderate: moderate permeability.	Moderate: moderate potential frost action; low strength.
Hardpan at a depth of 30 to 40 inches; medium piping hazard.	Not needed	Cobbly; hardpan at a depth of 30 to 40 inches; low available water capacity; slopes of 3 to 10 percent.	Severe: hardpan at a depth of 30 to 40 inches. Moderate in areas of moderate potential frost action; low strength.	Severe: hardpan at a depth of 30 to 40 inches.	Moderate: low strength; moderate potential frost action; hardpan at a depth of 30 to 40 inches.
Bedrock at a depth of 5 to 20 inches.	Not needed	Very cobbly; bedrock at a depth of 5 to 20 inches.	Severe: bedrock at a depth of 5 to 20 inches; slopes of 3 to 30 percent.	Severe: bedrock at a depth of 5 to 20 inches; slopes of 3 to 30 percent.	Severe: bedrock at a depth of 5 to 20 inches; slopes of 3 to 30 percent.
Hardpan at a depth of 11 to 20 inches; slopes of 1 to 40 percent.	Not needed	Hardpan at a depth of 11 to 20 inches.	Severe: hardpan at a depth of 11 to 20 inches; slopes of 1 to 40 percent.	Severe: hardpan at a depth of 11 to 20 inches; slopes of 1 to 40 percent.	Severe: hardpan at a depth of 11 to 20 inches; slopes of 1 to 40 percent.
Medium piping hazard; medium strength.	Not needed	Moderately slow permeability.	Moderate: moderate potential frost action; low strength.	Severe: moderately slow permeability.	Moderate: moderate potential frost action; low strength.

TABLE 4.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—				Soil features affecting—
	Topsoil	Sand	Gravel	Road fill	Farm pond reservoir areas
*Phage: PID2, PkD2, PLF2, PLG2, PMF2, PNG2, POF2, PPF2, PRF2, PSF2. For Black Ridge part of POF2, Pass Canyon part of PPF2, Red Butte part of PRF2, and Ushar part of PSF2, see those series.	Fair for PID2: thin layer. Poor for all other units: too gravelly or too cobbly.	Poor below a depth of 23 inches after sieving.	Poor below a depth of 23 inches.	Good where slopes are 1 to 15 percent. Fair where slopes are 15 to 25 percent. Poor where slopes are 25 to 60 percent.	Moderately rapid permeability; slopes of 1 to 60 percent.
*Pharo: PtB, PtD, PUD2, PVF, PWF2. For Usher part of PWF2, see Ushar series.	Fair for PtB, PtD, and PUD2: thin layer. Poor for PVF and PWF2: too gravelly or cobbly.	Not suitable	Poor below a depth of about 20 inches.	Good where slopes are 1 to 15 percent. Fair where slopes are 15 to 25 percent. Poor where slopes are 25 to 30 percent.	Moderately rapid permeability; slopes of 1 to 30 percent.
Poganeab: PxB, PyB	Poor: wet	Not suitable	Not suitable	Poor: water table at a depth of 0 to 30 inches; high potential frost action; low strength.	Slow permeability; slopes of 1 to 3 percent.
*Red Butte: RBG2, RCG2, RDG2, REG2, RFF2, RGF2. For Deer Creek part of REG2, Flowell part of RFF2 and Phage part of RGF2, see those series.	Poor: too cobbly	Not suitable	Not suitable	Moderate where slopes are 5 to 25 percent: moderate potential frost action. Poor where slopes are 25 to 50 percent.	Moderate permeability; slopes of 5 to 50 percent.
Red Rock: RhB	Fair: too clayey	Not suitable	Not suitable	Poor: high potential frost action; low strength.	Moderate permeability; slopes of 1 to 3 percent.
Riverwash: RK	Poor: too gravelly, cobbly, or stony.	Too variable to be rated.	Too variable to be rated.	Too variable to be rated.	Too variable to be rated.
Rob Roy: RLE, RMF, RNF.	Fair for RLE: too gravelly. Poor for RMF and RNF: too cobbly.	Not suitable	Not suitable	Poor: bedrock at a depth of 20 to 36 inches; moderate potential frost action; low strength.	Slow permeability; bedrock at a depth of 20 to 36 inches; slopes of 1 to 30 percent.
Rock land: RO	Poor: bedrock at a depth of 0 to 10 inches.	Not suitable	Not suitable	Poor: bedrock at a depth of 0 to 10 inches.	Bedrock at a depth of 0 to 10 inches.

properties of the soils—Continued

Soil features affecting—Con.			Degree and kind of limitations for—		
Farm pond embankments	Drainage for crops and pasture	Irrigation	Dwellings	Septic tank absorption fields	Local roads and streets
High to medium compacted permeability; medium piping hazard.	Not needed	Gravelly; low available water capacity; moderately rapid permeability.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 60 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 60 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action; low strength. Severe where slopes are 15 to 60 percent.
High to medium compacted permeability; medium piping hazard.	Not needed	Gravelly; low available water capacity; moderately rapid permeability.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Slight where slopes are 1 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 30 percent.
Medium to low shear strength; medium compressibility; low to medium piping hazard.	Slow permeability; poor outlets.	Slow permeability; water table at a depth of 0 to 30 inches.	Severe: water table at a depth of 0 to 30 inches; high potential frost action.	Severe: slow permeability; water table at a depth of 0 to 30 inches.	Severe: high potential frost action; water table at a depth of 0 to 30 inches; low strength.
Medium shear strength; medium piping hazard.	Not needed	Cobbly; slopes of 5 to 50 percent.	Moderate where slopes are 5 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 50 percent.	Moderate where slopes are 5 to 15 percent: moderate permeability. Severe where slopes are 15 to 50 percent.	Moderate where slopes are 5 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 50 percent.
Medium shear strength; medium piping hazard.	Not needed	Moderate permeability; slopes of 1 to 3 percent.	Severe: high potential frost action; low strength.	Moderate: moderate permeability.	Severe: high potential frost action; low strength.
Too variable to be rated.	Too variable to be rated.	Too variable to be rated.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding.
Bedrock at a depth of 20 to 36 inches.	Not needed	Bedrock at a depth of 20 to 36 inches; cobbly; slopes of 1 to 30 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action; low strength. Severe where slopes are 15 to 30 percent: bedrock at a depth of 30 inches.	Severe: bedrock at a depth of 20 to 36 inches; slow permeability.	Moderate where slopes are 1 to 15 percent: moderate potential frost action; low strength. Severe where slopes are 15 to 30 percent: bedrock at a depth of 20 to 36 inches.
Bedrock at a depth of 0 to 10 inches.	Not needed	Not suitable	Severe: bedrock at a depth of 0 to 10 inches.	Severe: bedrock at a depth of 0 to 10 inches.	Severe: bedrock at a depth of 0 to 10 inches.

TABLE 4.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—				Soil features affecting—
	Topsoil	Sand	Gravel	Road fill	Farm pond reservoir areas
Shale outcrop. Mapped with Colluvial land and Sheeprock series.	Poor: bedrock at the surface.	Not suitable	Not suitable	Poor: bedrock at the surface.	Bedrock at the surface.
*Sheeprock: SCC, SDF, SEF, SFF. For Cokel part of SEF and Ushar part of SFF, see Cokel and Ushar series. For outcrop part of SFF, see shale outcrop.	Poor: too gravelly or too sandy.	Poor after sieving	Fair to poor	Good where slopes are 2 to 15 percent. Fair where slopes are 15 to 25 percent. Poor where slopes are 25 to 30 percent.	Rapid permeability; slopes of 2 to 30 percent.
Shotwell: SHF	Poor: too cobbly	Not suitable	Not suitable	Poor: bedrock at a depth of 10 to 20 inches.	Bedrock at a depth of 10 to 20 inches; slopes of 10 to 30 percent.
Sigurd: SKE	Poor: too gravelly	Poor after sieving	Fair to poor	Good	Moderately rapid permeability; slopes of 3 to 15 percent.
*Snake Hollow: SLD, SLD2, SNE3, SOD. For Blackett part of SNE3 and Blue Star part of SOD, see Blackett and Blue Star series.	Fair where slopes are 3 to 15 percent: too gravelly. Poor where slopes are 15 to 20 percent.	Fair to poor below a depth of 24 inches after sieving.	Fair to poor below a depth of 24 inches after sieving.	Good	Moderately rapid permeability; slopes of 3 to 20 percent.
Snake Hollow variant: SRF.	Poor: too cherty	Not suitable	Not suitable	Good above the bedrock, which is at a depth of 20 to 36 inches.	Slopes of 10 to 30 percent; bedrock at a depth of 20 to 36 inches.
*Ushar: UAD2, UHC3, UHD, UHD2, ULF2, UMF2, UND, UOD2, UOF2, URF, USF, UTF2, UTG2. For Etta part of UND, Mill Hollow part of UOD2 and UOF2, Mosida part of URF, Murdock part of USF, and Phage part of UTF2 and UTG2, see those series.	Good where slopes are 1 to 8 percent. Fair where slopes are 8 to 15 percent. Poor where slopes are 15 to 30 percent. Poor for ULF2, UMF2, UOF2, URF, and UTF2: too gravelly or cobbly.	Fair to poor below a depth of 30 inches after sieving.	Fair to poor below a depth of 30 inches	Fair where slopes are 1 to 25 percent: moderate potential frost action. Poor where slopes are 25 to 70 percent.	Moderately rapid permeability below a depth of 30 inches; slopes of 1 to 70 percent.

properties of the soils—Continued

Soil features affecting—Con.			Degree and kind of limitations for—		
Farm pond embankments	Drainage for crops and pasture	Irrigation	Dwellings	Septic tank absorption fields	Local roads and streets
Bedrock at the surface.	Not needed	Not suitable	Severe: bedrock at the surface.	Severe: bedrock at the surface.	Severe: bedrock at the surface.
High to medium compacted permeability; medium to low piping hazard.	Not needed	Rapid permeability; low available water capacity.	Slight where slopes are 2 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.	Slight where slopes are 2 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent; pollution may be a hazard near drainageways.	Slight where slopes are 2 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are 15 to 30 percent.
Bedrock at a depth of 10 to 20 inches.	Not needed	Not suitable; cobbly; bedrock at a depth of 10 to 20 inches.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 10 to 30 percent.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 10 to 30 percent.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 10 to 30 percent.
High compacted permeability.	Not needed	Low available water capacity; moderately rapid permeability.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 15 percent.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 15 percent: pollution may be a hazard near drainageways.	Moderate: moderate potential frost action; slopes of 3 to 15 percent.
Medium to high compacted permeability; medium to low piping hazard.	Not needed	Moderately rapid permeability; moderate available water capacity; sand and gravel below a depth of 35 inches.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are more than 15 percent.	Slight where slopes are 3 to 8 percent. Moderate where slopes are 8 to 15 percent. Severe where slopes are more than 15 percent.	Moderate where slopes are 3 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 20 percent.
Bedrock at a depth of 20 to 36 inches; slopes of 10 to 30 percent.	Not needed	Slopes of 10 to 30 percent; bedrock at a depth of 20 to 36 inches.	Severe: bedrock at a depth of 20 to 36 inches; slopes of 10 to 30 percent.	Severe: slopes of 10 to 30 percent; bedrock at a depth of 20 to 36 inches.	Severe: bedrock at a depth of 20 to 36 inches; slopes of 10 to 30 percent.
Medium shear strength; moderate shrink-swell potential in upper 30 inches of material.	Not needed	Slopes of 1 to 70 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 70 percent.	Moderate where slopes are 1 to 15 percent: moderate permeability. Severe where slopes are more than 15 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 70 percent.

TABLE 4.—*Interpretations of engineering*

Soil series and map symbols	Suitability as a source of—				Soil features affecting—
	Topsoil	Sand	Gravel	Road fill	Farm pond reservoir areas
Ushar variant. Mapped only in associations with Flowell soils.	Fair: thin layer	Not suitable	Not suitable	Fair: moderate potential frost action; low strength.	Moderately slow permeability; slopes of 1 to 6 percent.
*Wallsburg: WBG2, WCG2, WMG2. For Maple Mountain part of WMG2, see Maple Mountain series.	Poor: too cobbly	Not suitable	Not suitable	Poor: bedrock at a depth of 10 to 20 inches.	Bedrock at a depth of 10 to 20 inches; slopes of 3 to 60 percent.
Wet alluvial land: Wt	Poor: too cobbly or gravelly; wet.	Too variable to be rated.	Too variable to be rated.	Poor: water table at a depth of 12 to 30 inches.	Too variable to be rated.
*Yardley: YAC, YME, YWF. For Maple Mountain part of YME and Wallsburg part of YWF, see Mountain and Wallsburg series.	Fair: thin layer	Not suitable	Not suitable	Poor: low strength. Fair in areas of moderate potential frost action.	Slow permeability; slopes of 1 to 30 percent.

[1] Pollution may be a hazard near drainageways.

In group A are coarse textured and moderately coarse textured soils that transmit water through their profile at a rapid rate. These soils absorb the precipitation that falls in most storms, and they have the highest rate of infiltration, even when they are thoroughly wet, and the lowest runoff potential.

In group B are the moderately coarse textured to moderately fine textured, deep or very deep soils that transmit water through their profile at a moderate rate. These soils have a moderate runoff potential.

In group C are the moderately coarse textured to fine-textured, deep to shallow soils that transmit water through their profile at a slow rate. These soils have a high runoff potential.

In group D are the medium-textured, moderately fine textured, and fine textured soils. Some soils in this group have a high water table; some have a thin mantle of soil over impervious material; some have a surface layer consisting of pervious material; and some are very deep. Soils in group D have the highest runoff potential of any soils in the survey area.

USDA texture is described in table 3 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic. If the moisture content is further increased, the material changes from a plastic to a liquid. The plastic limit is the moisture content at which the soil material changes from the semisolid to plastic; and the liquid limit, from a plastic to a liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index are estimated in table 2, but in table 4 the data on liquid limit and plasticity index are based on tests of soil samples.

properties of the soils—Continued

Soil features affecting—Con.			Degree and kind of limitations for—		
Farm pond embankments	Drainage for crops and pasture	Irrigation	Dwellings	Septic tank absorption fields	Local roads and streets
Moderate shrink-swell potential; medium shear strength.	Not needed	Moderately slow permeability.	Moderate: moderate potential frost action; low strength.	Severe: moderately slow permeability.	Moderate: moderate potential frost action; low strength.
Bedrock at a depth of 10 to 20 inches.	Not needed	Very cobbly; bedrock at a depth of 10 to 20 inches; slopes of 3 to 60 percent.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 3 to 60 percent.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 3 to 60 percent.	Severe: bedrock at a depth of 10 to 20 inches; slopes of 3 to 60 percent.
Too variable to be rated.	Water table at a depth of 12 to 30 inches; poor outlets.	Cobbly or gravelly; water table at a depth of 12 to 30 inches; subject to flooding.	Severe: subject to flooding; water table at a depth of 12 to 30 inches.	Severe: water table at a depth of 12 to 30 inches; subject to flooding.	Severe: subject to flooding; water table at a depth of 12 to 30 inches.
Low shear strength; medium compressibility.	Not needed	Slow permeability; slopes of 1 to 30 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action; moderate shrink-swell potential; low strength. Severe where slopes are 15 to 30 percent.	Severe: slow permeability; slopes of 1 to 30 percent.	Moderate where slopes are 1 to 15 percent: moderate potential frost action. Severe where slopes are 15 to 30 percent: low strength.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 3 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

As used in engineering, susceptibility to frost action refers to the probable effects on structures resulting from the freezing of soil material and its subsequent thawing. These probable effects are important mainly in selecting sites for highways and runways, but they are also of importance in planning any structure that is to be supported or abutted by soil that freezes. The action not only pertains to the heaving of soil as freezing progresses, but also to the excessive wetting and loss of soil strength during thaw.

Engineering interpretations of the soils

The estimated interpretations in table 4 are based on the engineering properties of soils shown in table 3, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Beaver-Cove Fort Area. In table 4, ratings are used to summarize limitation or suitability of the soils for all listed purposes other than for drainage of crops and pasture, irrigation, reservoir areas, and embankments. For these particular uses, table 4 lists those soil features

TABLE 5.—

[Tests performed by the Bureau of Public Roads in accordance with standard

Soil name and location	Depth from surface	Mechanical analysis [1]		
		Percentage passing sieve—		
		1 inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Inches			
Clegg loam:				
Sec. 27, T. 27 S., R. 8 W.	0–10	99	86	81
	21–28	97	87	79
	32–54	100	96	92
Cowers coarse sandy loam, eroded:				
NE¼NE¼, sec. 8, T. 27 S., R. 8 W.	0–10	----------	83	54
	10–21	----------	84	54
	33–70	----------	81	55
Decca loam:				
0.3 mile S. of Beaver bridge and 150 feet W., sec. 31, T. 29 S., R. 8 W.	4–10	96	84	76
	20–36+	76	40	29
Deer Creek cobbly loam:				
8.5 miles N. and 1.5 miles E. of Manderfield, sec. 11, T. 27 S., R. 7 W.	6–24	79	62	53
	24–46	----------	96	89
Escalante sandy loam:				
Sec. 17, T. 25 S., R. 8 W.	0–13	99	94	91
	13–25	97	92	86
Flowell loam:				
0.4 mile E. and 0.05 mile S. of NW corner of sec. 32, T. 27 S., R. 7 W.	10–24	----------	99	92
	24–54	----------	98	94
Hiko Peak cobbly loam:				
S. end of sec. 12, T. 30 S., R. 9 W.	2–9	97	86	76
	9–20	95	69	52
	34–60	97	61	33
Kessler very cobbly loam:				
Sec. 36, T. 25 S., R. 8 W.	3–8	87	83	82
	8–20	100	100	100
Manderfield loam:				
SE¼SE¼ sec. 9, T. 29 S., R 7 W.	5–16	89	68	58
	16–24	72	37	27
	24–55	70	32	21
Maple Mountain cobbly loam:				
Sec. 1, T. 27 S., R. 8 W.	0–10	88	73	62
	14–33	90	75	63
Mill Hollow very cobbly loam:				
SE¼ sec. 26, T. 24 S., R. 8 W.	7–14	91	87	83
	14–34+	94	89	84
Penoyer silt loam:				
Sec. 30, T. 25 S., R. 7 W.	0–50+	----------	----------	----------
Pharo very cobbly loam:				
Sec. 34, T. 24 S., R. 7 W.	2–8	94	73	66
	8–29	92	54	44
Red Butte very cobbly loam:				
SW¼ NW¼ sec. 34, T. 26 S., R. 7 W.	8–16	98	90	84
	16–60	77	50	41

Engineering test data
procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [1]—Continued					Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued		Percentage smaller than—					AASHO [2]	Unified [3]
No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.005 mm	0.002 mm				
					Percent			
69	48	43	21	16	28	7	A–4(1)	SM–SC
70	52	48	22	17	32	13	A–6(4)	CL
80	50	45	19	14	29	8	A–4(1)	SC, ML
35	29	26	9	6	36	11	A–2–6(0)	SM–SC
35	28	27	13	11	31	13	A–2–6(0)	SC
34	26	24	9	7	25	8	A–2–4(0)	SC
69	49	44	24	19	31	11	A–6(3)	SC
14	5	3	1	1	[4] NP	[4] NP	A–1–a(0)	GW–GM
44	32	26	19	18	58	30	A–2–7(3)	GC
76	49	45	20	19	34	8	A–4(2)	SM
80	37	33	16	12	22	4	A–4(0)	SM–SC
72	31	26	10	5	NP	NP	A–2–4(0)	SM
86	73	68	42	38	54	32	A–7–6(23)	CH
86	69	64	32	25	30	9	A–4(5)	CL
59	44	40	17	13	27	8	A–4(1)	SC
36	25	21	9	6	36	11	A–2–6(0)	SM
12	5	5	2	2	26	4	A–1–a(0)	SP–SM
76	61	47	27	20	37	11	A–6(5)	ML
97	92	72	57	45	61	26	A–7–5(30)	MH
42	29	25	11	9	30	12	A–2–6(0)	SC
15	7	6	3	2	28	12	A–2–6(0)	GP–GC
7	3	2	2	2	NP	NP	A–1–a(0)	GW
47	40	22	7	4	34	10	A–4(1)	GM–GC
50	43	25	19	17	56	30	A–7–6(8)	GC
80	70	65	30	22	38	15	A–6(9)	CL
72	60	56	44	36	54	21	A–7–5(12)	MH
100	92	88	37	22	29	7	A–4(6)	ML–CL
58	41	36	15	12	29	7	A–4(0)	SM–SC
33	23	18	8	5	26	4	A–1–b(0)	GM–GC
75	67	40	27	25	62	35	A–7–6(23)	CH
30	21	14	7	6	32	8	A–2–4(0)	GM

TABLE 5.—*Engineering*

Soil name and location	Depth from surface	Mechanical analysis [1]		
		Percentage passing sieve—		
		1 inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Inches			
Snake Hollow coarse sandy loam:				
0.25 mile S. of NE. corner of sec. 29, T. 28 S., R. 8 W.	12–21	99	93	72
	27–35	98	86	55
	35–66	90	75	44
Ushar loam:				
0.3 mile E. of SW. corner of sec. 8, T 28 S., R. 7 W.	9–20	98	93	88
	23–31	95	84	78
	31–51	80	42	34
Yardley loam:				
0.4 mile N. of SE. corner of sec. 17, T. 27 S., R. 8 W.	0–10	----------	99	91
	17–46	----------	93	84

[1] Mechanical analyses according to the AASHO Designation T 88 (*1*). Results obtained by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil. Based on total material. Laboratory test data corrected for amount discarded in the field sampling.

not to be overlooked in planning, installation, and maintenance.

Soil limitations are indicated by the ratings slight, moderate, and severe. *Slight* means soil properties are generally favorable for the rated use, or in other words, limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means soil properties are so unfavorable and so difficult to correct or overcome as to require major soil reclamation, special designs, or intensive maintenance. For some uses, the rating of severe is divided to obtain ratings of severe and very severe.

Soil suitability is rated by the terms *good, fair,* and *poor,* which have, respectively, meanings approximately parallel to the terms slight, moderate, and severe.

Following are explanations of some of the columns in table 4.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or its response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that will result at the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 4 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, and neither do they indicate quality of the deposit.

Road fill is soil material used in embankment for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among factors that are unfavorable.

Drainage for crops and pature is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosin,

test data—Continued

Mechanical analysis [1]—Continued					Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued		Percentage smaller than—					AASHO [2]	Unified [3]
No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.005 mm	0.002 mm				
					Percent			
45	30	28	15	14	33	6	A–2–4(0)	SM
25	9	8	4	3	NP	NP	A–1–b(0)	SW–SM
15	5	4	3	3	NP	NP	A–1–a(0)	SW–SM
83	70	64	31	23	34	16	A–6(9)	CL
70	58	54	24	17	29	7	A–4(2)	ML–CL
21	12	11	5	4	----------	NP	A–1	GM, GC
74	62	59	27	19	31	8	A–4(3)	ML–CL
66	46	44	28	22	42	20	A–7–6(5)	SC

[2] Based on AASHO Designation M 145-66I (*1*).
[3] Based on the Unified soil classification system (*9*).
[4] NP means nonplastic.

or soil blowing; soil texture; content of stones; accumulation of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held available to plants; and need for drainage, or depth to water table or bedrock.

Dwellings are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for dwellings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material from a depth of 18 inches to 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Local roads and streets have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand, and most cuts and fills are less than 6 feet deep.

Soil properties that most affect design and construction of roads and streets are load-supporting capacity and stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Soil test data

Table 5 contains engineering test data for some of the major soil series in Beaver-Cove Fort Area. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Tests that determine liquid limit and plastic limit were used to measure the effect of water on the consistence of soil material.

Formation and Classification of the Soils [5]

In the following pages the formation of the soils in the Beaver-Cove Fort Area is discussed, and the classification of soil series into some categories of the current system is shown. The results of laboratory analyses of the physical and chemical properties of selected soils as well as mechanical analyses are shown, mainly in tables.

Formation of the Soils

Soils are formed by forces of the environment acting upon soil material deposited or accumulated by various geologic agencies. The characteristics of a soil at any particular place on the earth depend upon the chemical and mineralogical composition of the parent material; the climate under which the parent material has existed since accumulation; the plant and animal life on and in the soil; the relief or lay of the land; and the length of time the parent material has been subject to active weathering. The relative importance of each factor differs from place to place, but generally interaction of all factors determines the kind of soil that forms in any given place.

Soil is generally evaluated in terms of kind, distinctness, and arrangment of horizons in the profile. The most notable processes of soil formation in this survey area are accumulation of organic matter in the surface layer, clay enrichment in the subsoil, and accumulation and cementation of carbonates. Also notable are the absence of free carbonates, and the depth to bedrock. Native vegetation and climate are the active factors of soil formation.

Parent material

Parent material is the weathered rock or unconsolidated rock material in which soils form. The hardness, grain size, and porosity of the parent material and its content of weatherable minerals greatly influence the formation of soils. In the Beaver-Cove Fort Area there are four main sources of parent material: Tushar Mountain on the eastern and southeastern side of the survey area, Pavant Mountains on the northeastern, Mineral Mountain on the western side, and areas of basalt near the Beaver-Millard County line. The soils formed in material from these sources reflect the influence of the parent material.

The Tushar Mountains are of Pliocene and Miocene age. Most of the parent rocks are igneous, but some are sedimentary. The rocks consist largely of andesite, calcic latite, tuffs, breccias, tuffaceous rhyolite, porphyritic latite, and pumice as well as, in small areas, quartzite, sandstone, and limestone.

Along the base of the Tushar Mountains, the soils formed in alluvium derived from the rocks of these mountains. Most of these soils are low in carbonates, but some have horizons where carbonates have accumulated. Even among some of these closely associated soils, the calcium carbonate equivalent varies considerably. For example, the Flowell, Ushar, Pharo, and Phage soils that have horizons of strong accumulation of carbonates have a calcium carbonate equivalent of 30 to 50 percent. Phage and Ushar soils average more than 40 percent carbonate throughout the 10- to 40-inch layer, but the associated Manderfield soils that lack horizons of carbonate accumulation have less than 8 percent calcium carbonate equivalent. The soils that formed in tuffaceous material are light colored, but they have less than 15 percent calcium carbonate equivalent.

From Cove Fort north along the east side of the survey area, the Pavant Mountains are of Triassic age. They are mainly sedimentary rocks of limestone and sandstone. The soils that formed in materials weathered from these rocks are high in carbonates. Kersick soils formed in residuum weathered from limestone and are calcareous throughout, but they are less than 20 inches deep to bedrock. At the southern end of these mountains are igneous rocks. The Pass Canyon soils that formed in material weathered from this igneous bedrock are shallow and are noncalcareous throughout.

In soils that formed in material weathered from the rocks of both the Tushar Mountains and the Pavant Mountains, the ratio of cation exchange capacity to clay is 0.7 to 1.2. This ratio indicates that 2:1 lattice clay minerals are dominant. Most of the soils that are used for irrigated crops formed in alluvium derived from these rocks.

The Mineral Mountains are of Tertiary age. The parent rocks are largely granite and other such acid igneous rocks as rhyolite, dacite, and quartz latite. In some areas there are andesites, trachyte, latite pyroclastics, and ignimbrites. On the eastern side of these mountains are small areas of limestone, and on the western side are some areas of basalt and basaltic andesite. North from Bearskin Park are areas where tuff and pumice underlie rhyolite, rhyolite porphyry, and obsidian.

The soils that formed in parent material weathered from granite are in the Bearskin, Cowers, and Snake Hollow series. These soils are coarse textured. They are 40 to 60 percent or more quartz grains or fragments, which are mainly the size of medium or coarse sand or gravel. They are low in carbonates. The ratio of cation exchange capacity to clay ranges from 0.6 to 1.0.

The areas of basalt near the Millard County line and also small areas in the southeastern part of the survey area are late Tertiary and Quarternary in age. The Mill Hollow, Kessler, and Black Ridge soils formed in this parent material. These soils are similar to those that formed in the material weathered from rocks of the Tushar Mountains, except that they are higher in bases. They have horizons where there is a strong accumulation of carbonates. Black Ridge soils have a hardpan of indurated lime. Kessler and Mill Hollow soils average more than 40 percent carbonate in the 10- to 40-inch layer.

Climate

Principally through precipitation and temperature, the climate in the Beaver-Cove Fort Area has directly influenced the weathering of parent material, the

[5] AUSTIN ERICKSON, soil correlator, helped prepare this section.

leaching and accumulation of carbonates, the redistribution of clay, and the accumulation of organic matter in the surface layer. Its effect on soil formation is closely associated with the kind and amount of vegetation and with topography. It directly affects the kinds of plant and animal life that can thrive.

The climate of this area is continental. Winters are cold, and summers are warm. Annual precipitation ranges from about 9 inches in areas at lower elevation to about 25 inches in areas at higher elevation. Much of it is in the form of snow that falls in winter and early in spring, but 30 percent is in the form of rain that falls in summer. There are wide variations in seasonal temperatures and in daily temperatures. The mean annual air temperature ranges from about 49° F in areas at lower elevation to about 39° in areas at higher elevation. The frost-free period ranges from about 115 days at lower elevation to about 65 days at higher elevation.

The three climatic zones in this survey area are the semiarid, the dry-subhumid, and the moist-subhumid. Generally, as elevation increases, the precipitation increases but the mean annual temperature and the length of the frost-free period decrease. As precipitation increases there is an increase in the darkness of the surface layer of the soils, the thickness of the A and B horizons, the content of organic matter, and the depth to carbonates. There is also some overlapping of climatic zones because of exposure. These zones and the features of soils that formed within them are discussed in the following paragraphs.

Semiarid zone.—This zone is on the low flood plains, alluvial fans, and valley bottoms where elevation ranges from 5,200 to about 6,100 feet. The annual precipitation is 9 to 12 inches; the mean annual temperature is 45° to 49° F, and the frost-free period is 100 to 115 days.

The soils in this zone, typically, have a light-colored surface layer (ochric epipedon) where only small amounts of organic matter have accumulated, and most are calcareous throughout. Those that have no soil horizon other than a slight accumulation of organic matter in the surface layer are in the Alovar, Fruitland, Oasis, Penoyer, and Sigurd series. Soils that have a distinct horizon of carbonate accumulation at a depth of 8 to 15 inches in addition to the slight accumulation or organic matter in the surface layer are in the Antelope Springs, Decca, Escalante, Hiko Peak, and Kessler series. The Antelope Springs and Decca soils also have a thin horizon of clay enrichment above the layer of carbonate accumulation.

Dry-subhumid zone.—This zone is on the lower benches, foothills, and older fans where elevation ranges from about 5,500 to 6,900 feet. Annual precipitation averages 12 to 14 inches; the mean annual air temperature is 44° to 48°; and the frost-free period is 100 to 110 days.

The soils in this zone commonly have a dark-colored surface layer (mollic epipedon) and are either partly or completely leached of carbonates and the more soluble salts. Most have accumulated enough organic matter in the upper 7 to 10 inches to give the dark color, but some have a light-colored surface layer. Among the soils that have a light-colored surface layer are those in the Firmage, Hansel, Oakden, Phage, and Sheeprock series. Those that have no soil horizons other than an accumulation of organic matter are in the Blue Star, Etta, and Mosida series. Soils that have a weak B horizon from which carbonates have been partly leached and in which some slight clay enrichment has taken place are in the Snake Hollow and Ushar series.

The soils that have distinct layers of carbonate accumulation are in the Blackett, Black Ridge, Cokel, Firmage, Hansel, Manderfield, Mill Hollow, Murdock, Oakden, Pavant, Phage, Pharo, and Red Butte series. In the Black Ridge, Murdock, Oakden, and Pavant soils, the carbonate layer is cemented and forms an indurated hardpan. Depth to the carbonate layer ranges from about 7 inches in the shallow Oakden soils to about 24 inches in the Manderfield soils. In addition to the layers in which organic matter and carbonates have accumulated, the Hansel, Manderfield, and Red Butte soils have a clay-enriched B horizon above the carbonate layers.

Moist-subhumid zone.—This zone is dominantly on high foothills and in mountain areas where the elevation is mainly about 6,700 to 8,500 feet. Annual precipitation averages 14 to 24 inches; the mean annual air temperature ranges from 39° to 44°; and the mean summer temperature ranges from 61° to 66°. The frost-free period is 65 to 100 days.

The soils in this zone commonly have a dark-colored surface layer (mollic epipedon) that is partly or completely leached of carbonates and the other more soluble salts. Essentially all the carbonates and the more soluble salts have been leached to a depth of 24 to 50 inches or more. About 3 to 5 percent of the surface layer is accumulated organic matter. The soils that have a distinct clay-enriched B horizon are in the Bearskin, Clegg, Deer Creek, Maple Mountain, Wallsburg, and Yardley series. The Clegg and Deer Creek soils also have a distinct layer of carbonate accumulation below the clay-enriched horizon.

Plant and animal life

Plant and animal life affect soil formation principally through the accumulation of organic matter and the translocation of plant nutrients from the lower to the upper layers. Living organisms influence soil structure and porosity and thus affect the rate at which air and water move through the soil. Some animals mix the soil and may retard the formation of distinct horizons. The decay of forest litter produces organic acids that, in solution, hasten leaching. Bases are leached rapidly from soil.

Bacteria and fungi are important in the development of soils because they break down undecomposed organic matter into humus. Some bacteria take nitrogen from the air and change it into a form that can be used by plants. Earthworms, small rodents, insects, slugs, and snails also influence soil formation.

In the Beaver-Cove Fort area, native vegetation along with climate is important in soil formation. Precipitation and temperature vary with elevation and exposure and thus directly influence the kinds and amounts of vegetation. Past grazing use has also been

a strong factor in determining present plant composition.

In the semiarid climatic zone the present vegetation on the nonsaline and nonalkali soils consists of sparse stands of big sagebrush, yellowbrush, cheatgrass, Indian ricegrass, squirreltail, galletagrass, scarlet globemallow, locoweed, and phlox. The grasses make up a low proportion of the vegetation. Only small amounts of organic matter are added to the soil because not much is produced. The Alovar, Fruitland, Oasis, and Sigurd soils generally have a surface layer that is less than 1 percent organic matter.

Also in the semiarid zone, the saline-alkali Antelope Springs soils and the silty Penoyer soils formed mainly under shadscale, but there were some small areas of greasewood, winterfat, Indian ricegrass, galleta, and black sagebrush. These soils are also low in organic-matter content because the vegetation is sparse and not much organic matter is produced.

In the low wet areas associated with irrigated soils the native vegetation is mainly wiregrass, broadleaf grasses, and sedges. These plants contribute large amounts of forage, and the high water table inhibits the activity of aerobic micro-organisms. Consequently, the organic-matter content of these soils is high. The Chipman soils have a surface layer that is about 6.5 percent organic matter.

In the dry-subhumid climatic zone the native vegetation is mainly juniper and pinyon, big sagebrush, bitterbrush, phlox, bluebunch wheatgrass, squirreltail, Indian ricegrass, Sandberg bluegrass, snakeweed, and forbs. In the dense stands of juniper-pinyon there is little understory and the soils are generally low in organic-matter content. In the areas that have little or no juniper-pinyon, the dominant vegetation is big sagebrush, cheatgrass, snakeweed, and other forbs, but there are smaller amounts of bitterbrush, tall poa, bluebunch wheatgrass, squirreltail, Indian ricegrass, and needleandthread. It is likely that the dominant vegetation was grass before overgrazing depleted the vegetation. The Ushar and Snake Hollow soils that are in these areas have a surface layer that is about 1.5 to 2.5 percent organic matter.

In the moist-subhumid climatic zone, the native vegetation is mainly big sagebrush, Gambel oak, bitterbrush, lupine, bluebunch wheatgrass, Sandberg bluegrass, squirreltail, slender wheatgrass, snowberry, and serviceberry. Because of the larger amount of precipitation, more plants grow and organic-matter content in the soils is higher. The Clegg, Deer Creek, Maple Mountain, and Yardley soils have a surface layer that is about 3 to 5 percent organic matter.

Relief

In the Beaver-Cove Fort Area, the dominant features of relief are (1) valley bottoms, recent alluvial fans, and flood plains; (2) older fans, terraces, benches and lower foothills; and (3) hills, mountain slopes, and ridges. The base of the Tushar and Pavant Mountains are at the eastern edge of the survey, and the Mineral Mountains are in the western part. The valley that is near Beaver and that extends westward toward Adamsville is larger than any other valley in the survey area. Elevation is mainly 5,200 to 8,500 feet, but some mountain peaks rise to about 9,600 feet.

Relief, or lay of the land, influences soil formation principally because it affects runoff, drainage, and microclimate. Runoff and streamflow from the mountains built extensive terraces and fans that were later dissected by streams so that narrow plains, flood plains, and recent fans formed. From the Tushar Mountains, drainage is principally in an east to west direction and from the Mineral Mountains in a west to east direction. Microclimate is associated with exposure and elevation.

On valley bottoms, recent alluvial fans, and flood plains, the soils are mainly well drained, but some are subject to overflow. These soils are mainly nearly level to sloping.

In the lowest areas and in some higher areas adjacent to streams, the soils receive runoff from adjacent areas and are poorly drained or somewhat poorly drained. Because of their low position, high water table, and lack of oxygen at some time of the year, they are mottled or gleyed. Water ponds on the surface, or the water table is high during periods of the year. Water-tolerant plants grow in abundance, and as a result, the soils have a surface layer that is high in organic-matter content and is dark colored. In these areas are the Chipman, Draper, James Canyon, and Poganeab soils. Unless drained, these soils are poorly drained or somewhat poorly drained. They have a high water table at least part of the time. This water table fluctuates with the rise and fall of stream flow and other runoff. Chipman soils have a surface layer that is about 6.5 percent organic matter.

On the valley bottoms and older flood plains are Antelope Springs soils. These soils are moderately well drained or well drained. They have a water table at a depth of more than 40 inches at some periods of the year. In these soils, sodium and other soluble salts have accumulated at a depth of 4 to 30 inches.

On the more recent fans and flood plains are the Alovar, Fruitland, Oasis, Penoyer, and Sigurd soils, These soils are well drained. They have a light-colored surface layer, but other than the slight accumulation of organic matter in the surface layer, they lack discernible soil horizons.

On the higher fans, terraces, benches, and foothills, the soils are well drained and mainly gently sloping to steep. Most of these soils have a dark-colored surface layer and an accumulation of carbonates at a depth of about 8 to 24 inches. Among the important soils on the older fans, terraces, and lower foothills are Ushar, Manderfield, Snake Hollow, Phage, Pharo, and Red Butte soils.

On the higher hills, mountain slopes, and ridges, the soils are well drained or somewhat excessively drained and mainly sloping or rolling to very steep. Most of the soils have a dark-colored surface layer and are partly or completely leached of carbonates and soluble salts. Some of the soils have a layer of clay enrichment. Clegg, Cowers, Deer Creek, Maple Mountain, Mineral Mountain, and Yardley soils are more strongly developed than other soils in the survey area. Their surface layer and subsoil are leached of carbon-

ates, and they have a distinct layer of clay enrichment. In some soils in these areas the influence of exposure is noticeable. For example, the soils on south-facing slopes have either a lighter colored surface layer or a thinner dark-colored surface layer than those soils at about the same elevation on north-facing slopes.

Time

Time is necessary for the factors of soil formation to act on parent material. The distinctness of soil horizon depends in part upon the time. The soils in the Beaver-Cove Fort Area range from young soils that have little or no differentiation of horizons to mature soils that have a well-developed profile.

In this survey area the least horizon differentiation occurs in the semiarid climatic zone in soils that formed in more recent alluvial deposits. Fruitland, Oasis, Penoyer, and Sigurd soils have no horizons other than a slight accumulation of organic matter in the surface layer. Escalante, Firmage, Kessler, and Hiko Peak soils formed in similar but older alluvial deposits in the same climatic zone and have layers of carbonate accumulation.

The Clegg, Cowers, Deer Creek, Maple Mountain, Mineral Mountain, and Yardley soils are strongly developed. They have, through time and the influence of climate, vegetation, and other factors, developed a dark-colored surface layer and a clay-enriched B horizon that are mainly free of carbonates. Some of these soils, such as Clegg, Deer Creek, and Mineral Mountain soils have distinct layers of carbonate accumulation.

Differences in profile development result from the combined effect of all soil-forming factors.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted 1938 (*2*) and later revised (*4*). The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in developments of the current system should search the latest literature available (*3, 7*).

The current system of classification has six categories. Beginning with broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. In table 6, the soil series of the survey area are placed in three categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. Three exceptions to this are the Entisols, Inceptisols, and Histosols, which occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Ent-i-sol).

SUBORDER. Each order is subdivided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the order. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquent* (*Aqu*, meaning water or wet, and *ent* from Entisol).

GREAT GROUP. Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), dark-red and dark-brown colors associated with basic rocks, and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Haplaquents (*Hapl*, meaning simple horizons, *aqu* for wetness or water, and *ent*, from Entisols).

SUBGROUP. Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Haplaquents (a typical Haplaquent).

FAMILY. Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and

TABLE 6.—*Classification of soil series*

Series	Family	Subgroup	Order
Alovar	Fine-silty, mixed (calcareous), mesic	Xeric Torrifluvents	Entisols.
Antelope Springs	Fine-loamy, mixed, mesic	Xerollic Natrargids	Aridisols.
Antelope Springs variant	Fine-loamy, mixed, mesic	Xerollic Natrargids	Aridisols.
Bearskin	Loamy, mixed, frigid	Lithic Argixerolls	Mollisols.
Blackett	Coarse-loamy, mixed, mesic	Aridic Calcixerolls	Mollisols.
Black Ridge	Clayey, montmorillonitic, mesic, shallow	Aridic Petrocalcic Palexerolls	Mollisols.
Blue Star	Coarse-loamy, mixed, mesic	Calciorthidic Haploxerolls	Mollisols.
Chipman	Fine-silty, mesic	Typic Calciaquolls	Mollisols.
Clegg	Fine-loamy, mixed, frigid	Calcic Pachic Argixerolls	Mollisols.
Cokel	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic.	Aridic Calcixerolls	Mollisols.
Cowers	Coarse-loamy, mixed, frigid	Typic Haploxerolls	Mollisols.
Decca	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Xerollic Haplargids	Aridisols.
Deer Creek	Fine, montmorillonitic, frigid	Typic Palexerolls	Mollisols.
Draper	Fine-loamy, mixed, mesic	Cumulic Haplustolls	Mollisols.
Draper variant	Sandy-skeletal, mixed, mesic	Aquic Haplustolls	Mollisols.
Escalante	Coarse-loamy, mixed, mesic	Xerollic Calciorthids	Aridisols.
Etta	Fine-loamy, mixed, mesic	Torrifluventic Haploxerolls	Mollisols.
Etta variant	Fine, montmorillonitic, mesic	Vertic Haploxerolls	Mollisols.
Firmage	Fine-loamy, mixed, mesic	Xerollic Calciorthids	Aridisols.
Flowell	Fine, montmorillonitic, mesic	Calcic Argixerolls	Mollisols.
Flowell variant	Fine, montmorillonitic, frigid	Calcic Argixerolls	Mollisols.
Fruitland	Coarse-loamy, mixed (calcareous) mesic	Typic Torriorthents	Entisols.
Hansel [1]	Fine-silty, mixed, mesic	Xerollic Haplargids	Aridisols.
Hansel variant	Fine-silty, mixed, mesic	Xerollic Haplargids	Aridisols.
Haybourne	Coarse-loamy, mixed, mesic	Xerollic Camborthids	Aridisols.
Hiko Peak	Loamy-skeletal, mixed, mesic	Xerollic Calciorthids	Aridisols.
James Canyon	Fine-loamy, mixed, mesic	Cumulic Haplaquolls	Mollisols.
James Canyon variant	Fine-loamy, mixed, mesic	Aquic Calcixerolls	Mollisols.
James Canyon variant	Fine, montmorillonitic, mesic	Typic Haplaquolls	Mollisols.
Kersick	Loamy, carbonatic, mesic	Lithic Xeric Torriorthents	Entisols.
Kessler	Fine-silty, carbonatic, mesic	Xerollic Calciorthids	Aridisols.
Manderfield	Fine-loamy over sandy or sandy-skeletal, mixed, mesic	Aridic Calcic Argixerolls	Mollisols.
Maple Mountain	Fine-loamy, mixed, frigid	Typic Argixerolls	Mollisols.
May Day	Loamy, mixed, frigid, shallow	Petrocalcic Palexerolls	Mollisols.
McQuarrie	Loamy, mixed, mesic	Lithic Argixerolls	Mollisols.
McQuarrie variant	Loamy-skeletal, mixed, mesic	Lithic Haploxerolls	Mollisols.
Mill Hollow	Fine-loamy, carbonatic, mesic	Aridic Calcixerolls	Mollisols.
Mineral Mountain	Fine, montmorillonitic, frigid	Mollic Haploxeralfs	Alfisols.
Mineral Mountain variant	Loamy-skeletal, mixed, frigid	Mollic Haploxeralfs	Alfisols.
Mineral Mountain variant	Fine, montmorillonitic, frigid	Mollic Haploxeralfs	Alfisols.
Mosida	Coarse-loamy, mixed, mesic	Torrifluventic Haploxerolls	Mollisols.
Mud Springs	Loamy-skeletal, mixed, frigid	Typic Haploxerolls	Mollisols.
Murdock	Coarse-loamy, mixed, mesic	Aridic Petrocalcic Palexerolls	Mollisols.
Oakden	Loamy, carbonatic, mesic, shallow	Xerollic Paleorthids	Aridisols.
Oasis	Coarse-loamy, mixed (calcareous), mesic	Xeric Torrifluvents	Entisols.
Paice	Fine-loamy, mixed, frigid	Petrocalcic Palexerolls	Mollisols.
Pass Canyon	Loamy-skeletal, mixed, mesic	Lithic Argixerolls	Mollisols.
Pavant	Loamy, mixed, mesic, shallow	Aridic Petrocalcic Palexerolls	Mollisols.
Penoyer	Coarse-silty, mixed (calcareous), mesic	Typic Torriorthents	Entisols.
Phage	Loamy-skeletal, carbonatic mesic	Xerollic Calciorthids	Aridisols.
Pharo	Loamy-skeletal, carbonatic mesic	Aridic Calcixerolls	Mollisols.
Poganeab	Fine-loamy, mixed (calcareous), mesic	Typic Fluvaquents	Entisols.
Red Butte	Loamy-skeletal, mixed, mesic	Aridic Calcic Argixerolls	Mollisols.
Red Rock	Fine-silty, mixed, mesic	Cumulic Haploxerolls	Mollisols.
Rob Roy	Fine, montmorillonitic, frigid	Typic Argixerolls	Mollisols.
Sheeprock	Sandy-skeletal, mixed, mesic	Xeric Torriorthents	Entisols.
Shotwell	Loamy, mixed (calcareous), mesic	Lithic Xeric Torriorthents	Entisols.
Sigurd	Loamy-skeletal, carbonatic, mesic	Xeric Torrifluvents	Entisols.
Snake Hollow	Coarse-loamy, mixed, mesic	Aridic Haploxerolls	Mollisols.
Snake Hollow variant	Loamy-skeletal, mixed, mesic	Aridic Haploxerolls	Mollisols.
Ushar	Fine-loamy, mixed, mesic	Calciorthidic Haploxerolls	Mollisols.
Ushar variant	Fine-loamy, mixed, mesic	Pachic Argixerolls	Mollisols.
Wallsburg	Clayey-skeletal, montmorillonitic, frigid	Lithic Argixerolls	Mollisols.
Yardley	Fine, mixed, frigid	Typic Argixerolls	Mollisols.

[1] The Hansel soils in the Beaver-Cove Fort Area are taxadjuncts to the series for which they are named. They are slightly redder than is within the range defined for the Hansel series.

consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy and so on, that are used to differentiate families (see table 6). An example is the coarse-loamy, siliceous, acid, thermic family of Typic Haplaquents.

SERIES. The series consists of a group of soils that formed in a particular kind of parent material and has genetic horizons that, except for texture of the surface soils, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, structure, reaction, consistence, and mineralogical and chemical composition.

The four soil orders represented in the Beaver-Cove Fort Area are Entisols, Aridisols, Mollisols, and Alfisols. In the following pages, the classification of soils by suborders is explained, and the soils in each subgroup are discussed.

Entisols.—The Entisols in this survey area are soils in the Orthents, Fluvents, and Aquents suborders. These soils formed in a warm, semiarid climate of cool, moist winters and hot, dry summers. These soils lack a B horizon, and they have a low content of organic matter. Unless irrigated, the soils in the Orthents and Fluvents suborders are generally dry throughout the root zone for more than 60 consecutive days during summer in most years. Soils of the Orthents and Fluvents suborders are well drained, and those of the Aquents suborder are poorly drained.

The soils of the Orthents suborder are loamy very fine sand or finer textured and extend to a depth of 40 inches or more or to bedrock. The content of organic matter decreases with increasing depth to less than 0.2 percent carbon at a depth of 50 inches. These soils are dominantly on the flood plains, recent fans, and valley bottoms.

The soils of the Fluvents suborder are similar to those of the Orthents suborder in texture, but their organic-matter content decreases irregularly with increasing depth or is not less than 0.2 percent carbon at a depth of 50 inches.

Because the soils of the Aquent suborder are poorly drained, they retain color characteristics typical of wetness at a depth of less than 20 inches.

In the following paragraphs the subgroups into which the soils of the Orthents, Fluvents, and Aquents suborders have been placed are discussed. These subgroups are Typic Torriorthents, Xeric Torriorthents, Lithic Xeric Torriorthents, Xeric Torrifluvents, and Typic Fluvaquents.

Typic Torriorthents consist of pale-brown soils that are low in content of organic matter. Unless irrigated, these soils are never saturated at a depth of less than 5 feet. They are dry in all parts more than three-fourths of the time when the soil temperature at a depth of 20 inches is above 41° F. These soils lack cemented layers at a depth of less than 40 inches or hard rock layers at a depth of less than 20 inches. The Fruitland and Penoyer soils are in this subgroup. They formed in recent alluvial deposits, but these deposits are loam or sandy loam where the Fruitland soils formed and silt loam where the Penoyer soils formed. Both soils are on flood plains and fans. The vegetation is dominantly sagebrush and grass.

Xeric Torriorthents consist of light brownish-gray or pale-brown to brown soils that are similar to soils of the Typic Torriorthent subgroup but are moist in some parts for more than 25 percent of the time when the soil temperature is above 41° F. The Sheeprock soils are in this subgroup. They are in the dry-subhumid climatic zone. They formed in alluvial deposits of very gravelly sand on rolling and steep hills. The natural vegetation is dominantly juniper, pinyon, shrubs, and grasses.

Lithic Xeric Torriorthents consist of light brownish-gray or pale-brown to brown soils that are similar to soils of the Xeric Torriorthents subgroup but the depth to hard rock is less than 20 inches. The Kersick and Shotwell soils are in this subgroup. Kersick soils formed in cobbly loam material weathered from limestone and calcareous sandstone. They have more than 40 percent calcium carbonate equivalent throughout. Shotwell soils formed in loam weathered from obsidian. Both soils occur on mountain slopes and ridges. The natural vegetation is dominantly juniper, shrubs, and grasses.

Xeric Torrifluvents consist of light-colored, well-drained soils that lack cemented layers or layers of distinct carbonate accumulation at a depth of less than 40 inches. They are moist in some parts more than 25 percent of the time when the soil temperature is above 41° F. Alovar, Oasis, and Sigurd soils are in this subgroup. These soils formed in recent alluvial deposits on fans and flood plains. Alovar soils are clay loam; Oasis soils are loam or sandy loam and are high in sodium content; and Sigurd soils are very gravelly loam or very gravelly sandy loam. Native vegetation is dominantly shrubs and grasses.

Typic Fluvaquents consist of soils that decrease irregularly in organic-matter content or that have organic carbon content of more than 0.2 percent to a depth of 50 inches. Poganeab soils are in this subgroup. They are poorly drained. The water table is most commonly at a depth of less than 30 inches. These soils formed in stratified, mixed alluvial deposits of clay loam and silty clay loam, on flood plains and recent fans. Native vegetation is dominantly meadow grasses and sedges.

Aridisols.—The Aridisols in this survey area are soils in the Orthids and Argids suborders. These soils formed in a warm, semiarid or dry-subhumid climate of cool, moist winters and long, hot, dry summers. Unless irrigated they are dry throughout the root zone for more than 60 consecutive days during summer. Typically, these soils have a thin, light-colored A horizon that is low in organic-matter content. Soils of the Orthids suborder have either a weak B horizon from which carbonates have been at least partly removed or a distinct horizon of carbonate accumulation. Soils of the Argids suborder have a B horizon that is enriched with clay. In places they also have a horizon of carbonate accumulation.

All of the Aridisols in this survey area are moist in some parts more than 25 percent of the time when the soil temperature is above 41° F. They have a surface

layer where more than 1 percent organic matter has accumulated.

In the following pages the subgroups into which the soils of the Orthids and Argids suborders have been placed are discussed. These subgroups are Xerollic Camborthids, Xerollic Calciorthids, Xerollic Paleorthids, Xerollic Haplargids, and Xerollic Natrargids.

Xerollic Camborthids consist of pale-brown soils that have a noncalcareous, light-colored A horizon and a weak B horizon. The Haybourne soils are in this subgroup. These soils formed in alluvial deposits weathered from granite. The deposits consist of coarse sandy clay loam or light loam. Carbonates have been leached to a depth of about 29 inches. These soils occur on fans in the semiarid climatic zone. The native vegetation is dominantly sagebrush and grass.

Xerollic Calciorthids are soils that have a strong accumulation of carbonates at a depth of 6 to 15 inches and are calcareous to the surface. Escalante, Firmage, Hiko Peak, Kessler, and Phage soils are in this subgroup. They range from sandy loam to loam or silt loam in texture. Phage and Hiko Peak soils are very gravelly and cobbly. Phage and Pharo soils average more than 40 percent carbonates in the 10- to 40-inch layer. Generally, these soils occur on rolling hills, fans, and lower mountain slopes in the semiarid and dry-subhumid climate zones. They formed in calcareous alluvial deposits. The native vegetation is dominantly sagebrush and grass, but there are some juniper trees.

Xerollic Paleorthids are soils that are similar to those classed as Xerollic Calciorthids, but the carbonate horizon is cemented and forms an indurated hardpan. The Oakden soils are in this subgroup. They have a thin, light brownish-gray A horizon and a white, indurated, lime-cemented hardpan underlain by limestone bedrock at a depth of about 11 inches. These soils formed in residuum weathered from limestone in the dry-subhumid climatic zone. The native vegetation is dominantly juniper trees, sagebrush, and grass.

Xerollic Haplargids are soils that have a light-colored A horizon and a clay-enriched B horizon. In this survey area Decca and Hansel soils are in this subgroup. Both soils have a clay-enriched B horizon and layers of carbonate accumulation below the B horizon, at a depth of about 8 to 15 inches. The Decca soils have a B horizon that is 8 to 10 percent more clay than the A horizon. These soils formed in alluvial deposits. The Decca soils are on fans, terraces, and rolling hills, and the Hansel soils are on fans. The native vegetation is dominantly sagebrush and grass, but there are some juniper trees.

Xerollic Natrargids are soils similar to those classed as Xerollic Haplargids, but the soils have a B horizon where sodium has accumulated. The Antelope Springs soils are in this subgroup. These soils are moderately well drained to well drained. They formed in alluvial deposits of clay loam and silty clay loam. They are on flood plains and the lower parts of fans in the semiarid climatic zone. These soils have a B horizon that has prismatic structure and that contains 7 to 20 percent more clay than the A horizon. The B horizon generally is 35 to 90 percent exchangeable sodium. The Antelope Springs soils also have horizons of carbonate accumulation below the B horizon. The native vegetation is dominantly shadscale.

Mollisols.—The Mollisols in this survey area are soils in the Xerolls, Ustolls, and Aquolls suborders. Typically, these soils have a dark-colored surface layer that is more than 7 inches thick and that is more than 1 percent organic matter. Base saturation of this layer is more than 50 percent.

The soils of the Xerolls suborder formed in a warm, dry-subhumid climate of cool, moist winters and hot, dry summers. Unless irrigated, they are dry throughout the root zone for more than 60 consecutive days during summer. These soils are mainly on foothills, mountain slopes, higher fans, and terraces. They may or may not have a clay-enriched B horizon or coarse fragments. The thickness of the surface layer, texture, calcium carbonate content, and the depth to underlying hard rock are variable. Soils of the Argixeroll subgroup have a clear to gradual boundary between the A and B horizons.

The soils of the Ustolls suborder are on the flood plains and river terraces and are seasonally wet unless they have been drained. Generally, they have a moist root zone during summer. In this survey area the soils of the Ustolls suborder formed in a warm, dry-subhumid or semiarid climate. They have somewhat poor drainage, and because of a high water table, they are moist most of the time.

The soils of the Aquoll suborder are similar to those of the Ustolls suborder, but they are wetter and retain certain characteristics associated with poor drainage. They are in depressions on flood plains and recent fans or are adjacent to streams.

In the following pages the subgroups into which the soils of the Xerolls, Ustolls, and Aquolls suborders have been placed are discussed. These subgroups are Typic Haloxerolls, Aridic Haploxerolls, Calciorthidic Haploxerolls, Torrifluventic Haploxerolls, Cumulic Haploxerolls, Aridic Calcixerolls, Typic Argixerolls, Aridic Calcic Argixerolls, Lithic Argixerolls, Typic Palexerolls, Petrocalcic Palexerolls, Aridic Petrocalcic Palexerolls, and Typic Calciaquolls.

Typic Haploxerolls are soils that, unless irrigated, are moist in some parts of the control section more than half of the time when the soil temperature is above 41° F. These soils have more than 75 percent base saturation in the upper 30 inches of the profile. Organic-matter content decreases regularly with increasing depth and is less than 0.3 percent organic carbon at a depth of 50 inches. These soils have a B horizon that lacks clay enrichment, or that has only slight clay enrichment. The dark-colored surface layer is less than 20 inches thick. The Cowers and Mud Springs soils are in this subgroup. These soils occur in the moist-subhumid climatic zone. They are noncalcareous to a depth of about 25 to 33 inches. The Cowers soils formed in alluvial deposits of loam, sandy clay loam, and gravelly sandy loam derived from granite. The Mud Springs soils formed in residuum weathered from granite, which is at a depth of about 25 inches. The soils in this subgroup are on mountain slopes. Native vegetation is dominantly oakbrush, service-

berry, and grasses on the Cowers soils and juniper, pinyon, and sagebrush on the Mud Springs soils.

Aridic Haploxerolls are soils similar to those classed as Typic Haploxerolls, but they are generally dry and their organic-matter content is generally slightly lower. The Snake Hollow soils are in this subgroup. They occur in the dry-subhumid climatic zone. They are dry in all parts of the 8- to 24-inch layer for more than half the time when the soil temperature is above 41° F. These soils formed in sandy loam alluvial deposits derived from igneous rocks. They are noncalcareous or only slightly calcareous throughout. They are on fans and terraces. The native vegetation is dominantly juniper and pinyon trees, grasses, and shrubs.

Calciorthidic Haploxerolls are soils similar to those classed as Typic Haploxerolls, but they are generally dry and have some accumulation of secondary carbonates at a depth of less than 40 inches. The Blue Star and Ushar soils are in this subgroup. They occur in the dry-subhumid climatic zone. They are noncalcareous to a depth of about 14 to 24 inches but have distinct horizons of carbonate accumulation below this depth. The Blue Star soils formed in alluvial deposits of gravelly sandy loam derived from igneous rocks. They occur on high fans. The Ushar soils formed in alluvial deposits of loam and clay loam derived from igneous rocks. These soils are on older fans and low mountain slopes. They have a weak B horizon that is essentially free of carbonates. The native vegetation is dominantly grasses, shrubs, and juniper and pinyon trees.

Torrifluventic Haploxerolls are soils that are similar to those of the typic subgroup, but are generally dry, and decrease irregularly in organic-matter content with increasing depth. Etta and Mosida soils are in this subgroup. They occur in the dry-subhumid climatic zone. Etta soils formed in alluvial deposits of clay loam derived from igneous rocks and are generally noncalcareous throughout. Mosida soils formed in alluvial deposits of loam and silt loam derived from mixed sedimentary and igneous rocks and are generally slightly calcareous throughout. The soils in this subgroup are on flood plains and fans. The native vegetation is dominantly sagebrush and grass.

Cumulic Haploxerolls are soils that are similar to those of the typic subgroup, but they have a dark-colored surface layer that is thicker than 20 inches. They decrease irregularly in content of organic matter with increasing depth, or the organic carbon content remains more than 0.3 percent to a depth of 50 inches. The Red Rock soils are in this subgroup. They have an organic-carbon content of more than 0.5 percent to a depth of 50 inches. They formed in mixed alluvial deposits of silt loam and silty clay loam on flood plains and valley bottoms. They are in the dry-subhumid climate zone. The native vegetation is dominantly sagebrush and grass.

Aridic Calcixerolls are soils that are generally dry. The Blackett, Cokel, Mill Hollow, and Pharo soils are in this subgroup. They occur in the dry-subhumid climatic zone. For more than half the time when the soil temperature is above 41° F, these soils are dry in all parts of the moisture control section, which is at depths between 4 and 12 inches in the Mill Hollow soils and at depths between 8 and 24 inches in the other soils. Blackett and Cokel soils formed in alluvial deposits of sandy loam derived from igneous rocks; Mill Hollow soils formed in alluvial deposits of loam derived from basalt; and Pharo soils formed in alluvial deposits of strongly calcareous, gravelly and very gravelly sandy loam, and silt loam. Blackett soils are on fans; Cokel soils on rolling hills and ridges; Mill Hollow soils on hills and lower mountain slopes; and Pharo soils on fans, hills, and mountain slopes. Blackett and Cokel soils are underlain by gravelly sand at a depth of about 20 inches. Layers of strong carbonate accumulation are about 9 inches below the surface in Blackett and Cokel soils and about 7 inches below the surface in Mill Hollow soils. The native vegetation is dominantly sagebrush, grass, and juniper and pinyon trees.

Typic Argixerolls are soils that formed under good drainage and that do not have hard rock or weathered rock at a depth of less than 20 inches. The characteristic dark-colored surface layer is less than 20 inches thick, and the subsoil has more than 75 percent base saturation throughout. These soils are usually moist, and they lack horizons of secondary carbonate accumulation at a depth of less than 50 inches. Maple Mountain, Rob Roy, and Yardley soils are in this subgroup. They occur in the moist-subhumid climatic zone and are on mountain slopes and older fans. Rob Roy soils formed in residuum weathered from basalt, and the Maple Mountain and Yardley soils formed in alluvial and colluvial deposits derived from igneous rocks. All these soils have a B horizon of heavy clay loam or clay, but the Rob Roy soil has a B horizon that is more than 35 percent clay and is underlain by basalt at about 31 inches. The native vegetation is mainly oakbrush, big sagebrush, and grass.

Calcic Pachic Argixerolls are soils that are similar to those of the Typic Argixeroll subgroup, but they have a dark-colored surface layer more than 20 inches thick and a layer of secondary calcium carbonate accumulation below the clay-enriched B horizon. The Clegg soils are in this subgroup. They occur in the moist-subhumid climatic zone and are on hills, mountain slopes, and older fans. These soils formed in alluvial deposits derived from igneous rocks. They have a B horizon of clay loam or heavy loam and a layer of strong calcium carbonate accumulation at a depth of about 30 inches. The B horizon has about 5 to 8 percent more clay than the A horizon. The dark color extends to a depth of about 28 inches. Native vegetation is dominantly oakbrush, big sagebrush, and grass.

Aridic Calcic Argixerolls are soils that are similar to those of the Typic Argixeroll subgroup, but they are generally dry and have a layer of secondary carbonate accumulation below the clay-enriched B horizon. The Manderfield and Red Butte soils are in this subgroup. They are in the dry-subhumid climatic zone. For more than half the time when the soil temperature is above 40° F, these soils are dry in all parts of the moisture control section, which is at a depth between 4 and 12 inches in the Manderfield soils and at a depth between 8 and 24 inches in the Red Butte

soils. Manderfield soils formed in alluvial deposits and the Red Butte soils in cobbly and gravelly alluvial and colluvial deposits. All of these deposits derived from igneous rocks. The Manderfield soils are on fans and outwash plains, and the Butte soils are on rolling hills and lower mountain slopes. The B horizon is loam or clay loam, in the Manderfield soils and cobbly clay loam in the Red Butte soils. Both of these soils have noncalcareous A and B horizons, but a layer of calcium carbonate accumulation occurs at a depth of about 16 inches in the Red Butte soils and at a depth of 24 inches in the Manderfield soils. The native vegetation is dominantly juniper and pinyon trees, shrubs, and grasses.

Lithic Argixerolls are soils that are similar to those of the Typic Argixeroll subgroup, but they are less than 20 inches deep to hard rock. The Bearskin, McQuarrie, Pass Canyon, and Wallsburg soils are in this subgroup. Hard rock or partly weathered rock is at a depth of 10 to 20 inches. The McQuarrie soils are in the dry-subhumid climatic zone, but the other soils are in the moist-subhumid climatic zone. The McQuarrie soils are on rolling hills and ridges, and the other soils are on mountain slopes and ridges. McQuarrie soils formed in residuum weathered from basalt and the rest of the soils in residuum weathered from other igneous rocks. The Bearskin, Pass Canyon, and Wallsburg soils are noncalcareous throughout. The McQuarrie soils are generally dry. The B horizon is cobbly clay in the Wallsburg soils, cobbly clay loam or cobbly sandy clay loam in the Pass Canyon soils, and sandy clay loam in Bearskin soils. The native vegetation is dominantly sagebrush, grasses, juniper, oakbrush, and mountainmahogany.

Typic Palexerolls are soils in which large amounts of clay have accumulated and that generally have an abrupt textural boundary between the A and B horizons. The Deer Creek soils are in this subgroup. These soils occur on mountain slopes and rolling hills and are in the moist-subhumid climatic zone. They have about 15 to 20 percent more clay in the B horizon than in the A horizon. Also, these soils have a layer of strong calcium carbonate accumulation below the B horizon. The native vegetation is dominantly oakbrush, sagebrush, and grasses.

Petrocalcic Palexerolls are soils that have an indurated, carbonate-cemented hardpan and are generally moist. The May Day and Paice soils are in this subgroup. These soils occur in the moist-subhumid climatic zone. More than half the time when the soil temperature is above 41° F, these soils are moist in some parts of the moisture control section, which is at a depth between 4 and 12 inches or which extends to a hardpan that is less than 12 inches from the surface. These soils have a clay-enriched B horizon above the hardpan. They formed in colluvial and alluvial deposits derived from igneous rocks. May Day soils are on mountain slopes, and Paice soils are on rolling hills. The B horizon is cobbly clay or cobbly sandy clay loam in May Day soils and clay loam in Paice soils. A carbonate-cemented hardpan occurs at a depth of about 17 inches in May Day soils and at a depth of about 24 inches in Paice soils. Native vegetation is dominantly juniper on the May Day soils and sagebrush, oakbrush, and grass on the Paice soils.

Aridic Petrocalcic Palexerolls are soils that are similar to those of the Petrocalcic Palexeroll subgroup, but they are generally dry. The Black Ridge, Murdock, and Pavant soils are in this subgroup. They occur in the dry-subhumid climatic zone. More than half of the time when the soil temperature is above 41° F, they are dry in all parts of the moisture control section, which is the 4- to 12-inch layer. The Murdock and Pavant soils lack clay-enriched B horizons. The Black Ridge soils have a B horizon that is clay or silty clay and that is clay enriched. The hardpan generally occurs at a depth of about 15 to 20 inches in the Pavant and Black Ridge soils and at a depth of about 27 inches in the Murdock soils. The Black Ridge soils formed in residuum weathered from basalt and in colluvial deposits derived from basalt. Murdock and Pavant soils formed in alluvial deposits derived from igneous rocks. Native vegetation is dominantly juniper and pinyon trees, sagebrush, and grass.

Cumulic Haplustolls are soils that have a dark-colored surface layer more than 20 inches thick. These soils decrease irregularly in organic-matter content with increasing depth, or they have an organic carbon content of more than 0.3 percent to a depth of 50 inches. The Draper soils are in this subgroup. They are somewhat poorly drained and are noncalcareous throughout. These soils formed in alluvial deposits derived from igneous rocks and quartzite. They occur on flood plains and river terraces. The water table is most commonly at a depth of 30 to 40 inches. Native vegetation is dominantly meadow grasses and clover.

Cumulic Haplaquolls are soils that have a dark-colored surface layer more than 24 inches thick. The organic-matter content decreases irregularly, or the organic carbon content is more than 0.3 percent to a depth of 50 inches or more. The James Canyon soils are in this subgroup. They have a chroma of 1 and a hue of 2.5Y or 5Y as well as some mottles, which show poor drainage. The water table is most commonly within 20 inches of the surface. These soils formed in mixed alluvial deposits of heavy silty clay loam or silty clay on fans and river terraces. Native vegetation is dominantly meadow grasses and sedges.

Typic Calciaquolls are soils that have a layer of strong calcium carbonate accumulation within 16 inches of the surface. Chipman soils in this survey area are in this subgroup. These soils formed in alluvial deposits of silty clay loam or clay loam. They are on flood plains, and they are somewhat poorly drained. They have a chroma of 1 and distinct mottles, which are characteristic of wet soils. The native vegetation is dominantly meadow grasses and sedges.

Alfisols.—The alfisols in this survey area are soils that formed in the moist-subhumid climatic zone and are generally moist, but their root zone is dry throughout for more than 60 consecutive days in summer. They have either a light-colored surface layer or a thin, dark-colored surface layer, and they have a clay-enriched B horizon.

Soils of the Xeralfs suborder have a clay-enriched B horizon of any texture and a clear to gradual boundary between the A and B horizons. Typically, they

have a light-colored A horizon that is low in organic-matter content.

In the following pages the subgroup into which the soils of the Xeralf suborder have been placed is discussed. This subgroup is the Mollic Haploxeralfs.

Mollic Haploxeralfs consists of soils that are similar to those of the typic subgroup, which do not occur in this survey area, but they have a dark-colored surface layer 6 to 9 inches thick. These soils have a slight to moderate clay enrichment and B horizon development. The B horizon has more than 75 percent base saturation. The Mineral Mountain soils are in this subgroup. They are well drained. They have a B horizon of cobbly heavy clay loam or clay. These soils formed in colluvial and alluvial sediments on mountain slopes. Natural vegetation is dominantly juniper and pinyon trees, shrubs, and grasses.

Laboratory Analyses[6]

The results of laboratory analyses of samples, taken at the site of the representative profile, are shown by horizons in tables 7 and 8. The analyses were made by the Soil Conservation Service and Utah State University Cooperative Soil Laboratory, Logan, Utah.

Methods of Analyses

For data in table 7, all samples were air-dried in the laboratory. They were then passed through round, 2-millimeter openings of sieves. Some samples that appeared to contain no appreciable amount, or less than 5 percent, of pebbles or stones were poured through a mechanical crusher that has openings about 4 millimeters in diameter. Other samples that contained an appreciable amount of pebbles or stones were broken up in an iron mortar without crushing the pebbles or stones. If necessary, a Riffle sampler was used to reduce the size of the sample. Each laboratory sample was mixed thoroughly to insure uniformity, and after this mixing, all analyses were made of the fraction that was less than 2 millimeters in diameter. The percentage of material greater than 2 millimeters in size was calculated by dividing the weight of the faction retained in the 2-millimeter sieve by the initial weight of the air-dry sample. Subsamples less than 2 millimeters in diameter were ground small enough to pass a sieve of 0.3 millimeter. A mortar and pestle were used for the grinding. These subsamples were used to determine organic carbon and the calcium carbonate equivalent.

The reaction, or pH, was measured with a line-operated pH meter, using a glass electrode with a calomel reference electrode (*6*). To determine the pH of soil-water suspensions in a ratio of 1 to 5, the suspensions were stirred vigorously immediately before the electrodes were inserted. At the first indication of stabilization, the pH was read; then, the process was repeated until duplicate readings were obtained. Distilled water, or water free of carbon dioxide, was used for all soil-water suspensions.

Organic carbon was determined by the wet oxidation method, in which chromic acid is used. The samples were heated during the oxidation process as described in method No. 24 of the U.S. Department of Agriculture Handbook No. 60 (*6*). Silver sulfate was added to the sulfuric acid to prevent oxidation of chlorides in samples in which total soluble salts were 0.1 percent or more. After oxidation and dilution, an excess of ferrous ammonium sulfate was added to the sample, and the material was then back-titrated with standard potassium permanganate. The permanganate also acted as an indicator, and a special titration light was used to facilitate detection of the end point.

The macro-Kjeldahl method (*8*) was used to determine total nitrogen, and selenium metal was used as a catalyst in the digestion mixture. Enough water (about 15 to 20 milliliters) was added to the soil and digestion mixture in the flask to thoroughly wet the material before adding the acid for digestion. The distilled ammonia was caught in boric acid solution of 2 percent that contained a specially mixed indicator of bromocresol green and new coccine. This solution was titrated with standard solution (1/14 *N*) of sulfuric acid.

A pipette cell that had platinized platinum electrodes, in which the cell constant was 0.5, was used with a resistance bridge to measure the electrical conductivity of the saturation extract (*6*). This cell was equipped with a tapping key switch so that excessive flow of electric current was avoided. An excessive flow of current could have heated the solution or polarized the electrodes. All values for electrical conductivity are expressed in millimhos per centimeter at 25° C.

The calcium carbonate equivalent was determined by allowing varying weights of sample to react with 2 *N* hydrochloric acid in constant-volume glass containers (*8*). The percentage of lime was determined with manometer readings that were referred to a curve showing percentages for standard samples of calcium carbonate. Calcium carbonate equivalent is expressed as a percentage of $CaCO_3$.

The one-third-atmosphere moisture percentage was determined by using the pressure plate apparatus in which saturated samples of the soil were allowed to come to equilibrium on a porous ceramic membrane at ⅓-atmosphere tension. Sample preparation may have increased the ⅓-bar moisture retention, and the ⅓-bar values may be erroneously high. The 15-atmosphere moisture percentage was determined using the pressure membrane apparatus. As in the ⅓-atmosphere moisture determination, samples of soil were placed in retaining rings 1 centimeter in depth, allowed to saturate with water for at least 16 hours, and then brought to equilibrium at a 15-atmosphere pressure differential. All moisture constants are expressed as percentage of the ovendry soil.

To find the cation exchange capacity, samples of soil material less than 2 millimeters in diameter were saturated with sodium by four consecutive washings and centrifugations using 1*N* sodium acetate solution with pH adjusted to 8.2 (*6*). Soluble sodium acetate was

[6] JAMES P. THORNE, soil scientist, head of Cooperative Soil Laboratory, Logan, Utah, made the chemical and physical analyses.

TABLE 7.—*Physical and chemical*

[Analyses made by the Soil Conservation Service and the Utah State University Cooperative

Soil name	Horizon	Depth from surface	Reaction		Organic matter	
			Saturated paste	1:5 soil-water ratio	Total organic matter	Organic carbon
		Inches	*pH*	*pH*	*Percent*	*Percent*
Antelope Springs silt loam, low lime subsoil variant.	A21	0–¾	9.6	10.3	0.58	0.34
	A22	¾–1½	9.7	10.1	.60	.35
	A2B2	1½–4	9.6	10.4	.69	.40
	B21t	4–7	10.0	10.6	.53	.31
	B22t	7–14	10.0	10.4	.36	.21
	C1	14–32	8.8	10.0	.19	.11
	IIC2	32–40	8.5	10.2	.46	.27
	IIIC2	40–60	8.3	9.8	.31	.18
Blackett coarse sandy loam	A11	0–2	7.7	8.8	1.85	1.08
	A12	2–9	7.5	8.7	2.44	1.42
	C1ca	9–40	7.6	8.8	1.56	.91
	C2ca	40–56	7.9	9.2	.15	.09
	C3	56–70				
Chipman silty clay loam	A11	0–6	7.8	8.9	6.38	3.71
	A12	6–20	8.2	9.1	3.58	2.08
	C1ca	20–30	8.2	9.1	3.34	1.94
	C2	30–40	7.8	9.0	1.31	.76
	C3	40–60	7.7	8.8	1.24	.72
Clegg loam	A1	0–10	6.4	7.0	4.36	2.54
	B1	10–21	6.8	7.5	1.42	.83
	B2t	21–28	7.0	7.7	1.27	.74
	B3ca	28–32	7.3	8.2	1.18	.69
	C1ca	32–54	7.6	8.7	.65	.38
	C2ca	54–56	8.1	9.1	.30	.18
Cowers coarse sandy loam	A1	0–10	6.6	7.3	4.09	2.38
	B2	10–21	6.3	7.1	1.87	1.09
	B3	21–33	6.6	7.5	.72	.42
	C	33–70	7.5	8.8	.46	.27
Decca loam	A1	0–4	7.5	8.6	1.75	1.02
	B2t	4–10	7.3	8.9	1.07	.62
	B3ca	10–15	7.6	9.3	.98	.57
	C1ca	15–20	7.4	8.8	1.10	.64
	IIC2	20–36	7.5	8.8	.50	.29
Deer Creek cobbly loam	A1	0–6	6.6	7.5	3.02	1.76
	B1t	6–11	6.5	7.4	2.36	1.37
	B2t	11–24	6.4	7.3	1.44	.84
	C1ca	24–46	7.4	8.8	.79	.46
	C2ca	46–65	7.6	9.0	.18	.11
Etta loam	A1p	0–3	7.3	7.9	5.01	2.91
	A12	3–13	7.2	7.6	2.03	1.18
	C1	13–28	7.0	7.6	.77	.45
	C1	28–40	6.9	7.5	.69	.40
	C2	40–64	6.7	7.1	1.10	.64
Flowell loam	A1	0–4	6.4	7.5	1.77	1.03
	B1t	4–10	6.4	7.9	1.14	.66
	B2t	10–24	7.8	8.6	1.05	.61
	Cca	24–54	8.4	9.7	.84	.49
Fruitland loam	A1p	0–7	8.8	8.5	1.47	.86
	C1	7–23	8.0	8.5	.63	.37
	C2	23–48	7.7	8.6	.39	.23
	C3	48–60	8.0	8.6	.22	.13
Hiko Peak cobbly loam	A1	0–2	7.6	8.5	1.38	.80
	B2	2–9	7.5	8.4	1.62	.94
	C1ca	9–20	7.4	8.6	1.24	.72
	C2ca	20–34	8.0	9.1	.60	.35
	IIC3	34–60	9.5	9.5	.26	.15

properties of selected soils

Soil Laboratory, Logan, Utah. Dashes indicate that no determination was made]

Organic matter—Continued		Electrical conductivity	$CaCO_3$ equivalent	Moisture tension		Cation exchange capacity	Exchangeable sodium percentage
Nitrogen	Carbon-nitrogen ratio			1/3 atmosphere	15 atmospheres		
Percent		*Mmhos per cm at 25° C*	*Percent*	*Percent*	*Percent*	*Meq per 100 gm of soil*	
0.032	10.6	4.1	3.0	14.1	4.9	14.5	62
.040	8.8	4.1	4.0	20.6	9.4	21.6	86
.042	9.5	5.0	3.8	24.0	12.1	21.5	86
.032	9.7	15.8	7.2	23.7	10.7	23.9	64
.026	8.1	23.7	7.4	25.2	15.5	23.7	61
.013	8.5	13.9	2.2	20.1	11.2	18.4	41
		2.4	1.6	34.6	14.5	30.2	36
		2.3	2.2	26.9	13.8	20.5	27
.090	12.0	.72	9.2	15.4	7.6	15.1	2
.102	13.9	.68	15.4	17.5	9.5	16.1	1
		.51	41.1	26.7	11.6	12.4	2
		.63	8.1	19.1	7.8	17.3	9
.356	10.4	1.71	8.4	47.0	30.2	43.5	2
.176	11.8	.91	11.4	42.8	22.0	34.7	2
		.74	15.9	42.6	23.4	36.5	
		.60	.4	33.9	14.7	32.7	2
		.60	.1	34.1	17.0	33.5	1
.181	14.0	.72		21.2	10.0	20.3	1
.080	10.4	.51		22.0	11.2	22.8	1
		.60		23.6	11.6	22.7	1
		.53	21.9	25.5	10.9	19.0	1
		.54	33.1	20.8	9.0	14.5	2
		.82	20.9	21.4	9.4	15.4	5
.182	13.1	.83		19.0	9.0	19.1	
.095	11.5	.44		18.2	8.7	16.3	
		.62		15.5	6.6	11.9	
		.44	5.1	13.4	5.7	10.1	
.094	10.8	1.2		17.2	10.4	17.0	9
.062	10.0	.8		20.0	9.6	25.0	7
.060	9.5	.7	4.9	20.6	10.1	22.6	7
.067	9.6	1.9	23.3	23.3	9.0	17.2	8
		2.1	2.8	6.4	6.6	8.6	18
.126	14.0	1.80		17.9	10.4	19.4	1
.123	11.1	.47		30.4	17.7	31.0	1
		6.74		32.9	19.8	37.3	1
		.77	39.6	24.9	9.7	14.7	1
		.78	16.5	19.5	8.7	17.9	3
.268	10.9	1.56	.4	24.7	12.8	28.8	0
.101	11.7	.74	.3	24.2	10.5	25.7	1
.043	10.5	.63	.2	18.7	11.9	20.2	1
.036	11.1	.43	.2	22.8	16.9	24.2	1
.053	12.1	.70	.2	30.7	10.3	38.7	1
		.72		16.5	8.5	16.5	1
		.61		21.9	11.3	19.3	3
		.95		32.5	18.5	34.8	6
		5.05	33.0	27.6	10.6	15.1	25
.093	9.2	.99	7.8	23.3		20.2	3
.045	8.2	.66	6.4	21.6		21.5	3
.031	7.4	.64	4.2	16.9		18.1	4
.021	6.2	.74	6.8	14.3		14.2	5
.079	10.1	.76	4.1	18.9	8.7	21.4	1
.094	10.0	.59	8.4	20.3	11.0	22.9	1
		.61	33.1	24.1	11.8	16.1	1
		.95	18.7	16.3	8.2	16.9	10
		.77	8.9	9.8	6.3	15.4	19

TABLE 7.—*Physical and chemical*

Soil name	Horizon	Depth from surface	Reaction		Organic matter	
			Saturated paste	1:5 soil-water ratio	Total organic matter	Organic carbon
		Inches	*pH*	*pH*	*Percent*	*Percent*
James Canyon silty clay loam, heavy variant.	A11	0–7	7.8	8.6	6.4	3.73
	A12	7–17	7.6	8.4	4.7	2.78
	B2	17–34	8.0	8.6	.43	.25
	C1	34–40				
	C2	40–55	7.7	7.7	.53	.31
James Canyon loam, calcareous variant	A11	0–4	8.0	8.6	3.16	1.84
	A12	4–16	8.0	8.5	2.96	1.72
	ACca	16–34	8.0	8.6	3.4	1.97
	C	34–60	7.7	8.4	.45	.26
Kessler very cobbly loam	A11	0–3	7.3	8.7	1.65	.96
	A12	3–8	7.5	8.7	1.66	.97
	C1ca	8–20	7.6	9.2	1.24	.72
	C2ca	20–38	7.9	9.3	.52	.30
	C3	38–40	7.7	9.2	.65	.38
Manderfield loam	Ap	0–5	7.3	8.2	2.79	1.62
	B2t	5–16	7.6	8.4	1.10	.64
	B3	16–24	8.3	9.1	1.03	.60
	IIC1	24–33	8.5	9.1	.50	.29
	IIC1	33–46	7.9	8.8	.45	.26
	IIC1	46–60	8.0	9.0	.34	.20
Maple Mountain cobbly loam	A1	0–10	6.7	7.8	3.59	2.09
	B21t	10–14	6.6	7.8	2.12	1.23
	B22t	14–33	6.3	7.4	1.34	.78
	B23t	33–50	7.1	8.1	.76	.44
	C	50–60				
Mill Hollow very cobbly loam	A11	0–2	7.2	8.1	1.70	.99
	A12	2–7	7.4	8.4	2.39	1.39
	C1ca	7–10	7.5	8.5	1.92	1.12
	C2ca	10–14	7.5	8.8	1.80	1.05
	C3ca	14–34	7.7	8.8	1.48	.86
Mosida loam	Ap	0–6	8.0	8.6	2.16	1.26
	C1	6–20	8.2	9.5	.77	.45
	C2	20–48	8.4	9.5	1.11	.65
	C3	48–66	8.8	9.6	.70	.41
Mud Springs cobbly coarse sandy loam	A11	0–6	6.4	7.5	2.00	1.16
	A12	6–10	6.4	7.4	1.70	.99
	B21	10–17	7.1	7.9	1.16	.68
	B22	17–25	7.0	7.7	.84	.49
Murdock silt loam	Ap	0–4	7.5	8.1	1.91	1.11
	A12	4–9	7.2	7.8	1.89	1.10
	C1ca	9–15	7.8	8.7	1.86	1.08
	C2ca	15–27	8.1	8.7	1.48	.86
Pharo very cobbly loam	A11	0–2	7.5	8.8	4.20	2.44
	A12	2–8	7.4	8.3	3.19	1.86
	C1ca	8–29	7.7	8.7	.56	.33
	C2ca	29–60	7.7	8.9	.15	.09
Poganeab clay loam	A1	0–7	8.3	9.2	1.94	1.13
	B2	7–15	8.5	9.4	1.19	.69
	C1	15–27	8.3	9.3	1.96	1.14
	C2	27–38	8.0	9.0	1.84	1.07
	IIC3	38–60	8.0	9.0	1.15	.67
Red Butte very cobbly loam	A1	0–3	6.7	7.5	3.25	1.89
	B1	3–8	6.5	7.4	2.88	1.68
	B2t	8–16	6.5	7.4	1.26	.73
	C1ca	16–20	7.2	8.7	1.12	.65
	C2ca	20–60				

properties of selected soils—Continued

Organic matter—Continued		Electrical conductivity	$CaCO_3$ equivalent	Moisture tension		Cation exchange capacity	Exchangeable sodium percentage
Nitrogen	Carbon-nitrogen ratio			1/3 atmosphere	15 atmospheres		
Percent		*Mmhos per cm at 25° C*	*Percent*	*Percent*	*Percent*	*Meq per 100 gm of soil*	
0.251	14.9	1.45	12.3	53.5		36.5	4
.192	14.5	.94	2.2	46.6		26.1	3
.028	8.9	.82	.3	26.0		17.6	3
.023	13.5	.36	.2	30.4		25.2	1
.158	11.6	.71	7.6	34.8		28.6	1
.152	11.3	.59	12.8	37.1		28.1	1
.154	12.8	.56	19.3	42.4		27.4	2
.023	11.3	.50	1.3	31.1		28.4	2
.094	10.2	.82	26.6	26.3	12.2	18.0	2
.083	11.7	.63	31.1	26.5	13.5	17.6	2
.059	12.2	4.32	58.2	40.1	18.5	13.9	12
		11.8	45.3	33.5	16.8	15.6	28
		37.8	37.0	32.7	15.8	19.3	32
.156	10.4	.89	.6	22.6	16.3	20.4	3
.062	10.3	.65	.6	20.5	11.1	20.8	3
.074	8.1	.70	7.6	20.8	10.1	17.9	4
.035	8.3	.76	3.3			11.2	5
.031	8.4	.46	3.1	9.0		10.6	7
.025	8.0	.70	4.2	8.7	5.5	25.2	3
.135	15.5	.63		21.8	9.7	18.8	
.09	13.8	.67		24.2	13.4	22.0	
		.41		28.5	16.6	27.9	
		.52		24.1	11.7	23.3	
.114	8.2	1.0	.3	23.7	10.8	24.2	1
.131	10.6	.75	4.9	25.1	13.1	26.3	1
.109	10.3	.57	27.3	31.1	16.3	21.3	1
		.49	57.4	34.2	17.2	15.1	2
		.37	45.6	35.5	15.4	11.7	2
.109	11.6	.91	1.8	20.0		19.6	
.044	10.2	1.02	1.7	17.0		20.3	
.055	11.8	.96	1.0	21.7		24.8	
.043	9.5	1.62	4.4	22.2		21.5	
.093	12.5	.47		8.8	4.2	11.7	1
.082	12.1	.54		10.5	4.8	12.2	1
		3.11		13.3	5.6	12.3	2
		.90		14.6	6.1	11.9	1
.103	10.8	.98	.3	21.6	14.1	18.5	2
.105	10.5	.76	.6	23.8	16.8	31.3	3
.109	9.9	.70	18.2	28.7	15.8	28.7	3
.088	9.8	.60	19.7	32.1	15.5	19.2	3
.178	13.7	1.80	11.7	18.6	8.4	19.5	2
.169	11.0	1.52	15.7	18.5	8.9	20.6	1
		.55	55.8	20.0	6.3	8.9	2
		.43	43.4	29.5	13.3	16.0	1
.092	12.3	5.03	7.8	31.4	15.0	22.7	12
.066	10.5	2.52	11.5	36.0	17.7	31.5	6
.089	12.7	1.74	8.3	33.8	14.1	30.5	5
.088	12.2	1.36	11.1	30.6	13.3	27.6	5
.051	12.9	1.07	16.2	34.9	18.3	32.1	4
.132	14.3	.57	0	23.8	9.2	21.7	1
.119	14.1	.48		24.1	12.4	25.6	1
		.48		24.2	13.1	24.1	1
		.67	58.6	24.2	10.2	12.5	1

TABLE 7.—*Physical and chemical*

Soil name	Horizon	Depth from surface	Reaction		Organic matter	
			Saturated paste	1:5 soil-water ratio	Total organic matter	Organic carbon
		Inches	*pH*	*pH*	*Percent*	*Percent*
Red Rock silt loam	A11	0–3	6.8	7.7	5.77	3.36
	A12	3–8	6.9	7.8	2.15	1.25
	B21	8–18	7.1	7.9	1.60	.93
	B22	18–28	7.4	8.5	1.32	.77
	C	28–46	7.7	8.9	.96	.56
Snake Hollow coarse sandy loam	A1	0–4	7.2	8.3	2.02	1.18
	B1	4–9	7.3	8.4	1.48	.86
	B21	9–12	7.3	8.4	.98	.57
	B22	12–21	7.4	8.3	.74	.43
	B3	21–27	7.3	8.3	.43	.25
	C1	27–35	7.4	8.6	.46	.27
	C2	35–66	7.7	8.7	.20	.12
Ushar loam	A11	0–3	7.1	8.0	1.77	1.03
	A12	3–6	6.9	7.9	1.74	1.01
	B1	6–9	7.1	8.1	1.43	.83
	B21	9–20	7.4	8.4	1.19	.69
	B22ca	20–23	7.7	9.0	1.20	.70
	C1ca	23–31	7.9	9.3	.91	.53
	C2ca	31–51	8.2	9.6	.86	.50
	C3	51–60	7.9	9.2	.57	.33
Yardley loam	A1	0–10	6.2	7.5	3.20	1.86
	B21t	10–17	6.3	7.6	1.14	.66
	B22t	17–46	6.3	7.6	.58	.34
	C	46–60	6.9	7.9	.31	.18

removed by washing with 95 percent ethanol. The exchangeable sodium was then removed using three consecutive washings with neutral normal ammonium acetate. The sodium was then measured on the flame photometer.

The exchangeable sodium percentage was obtained by the following computation (*6*):

$$\text{ESP} = \frac{\text{Exchangeable sodium}}{\text{Cation exchange capacity}} \times 100.$$

All percentage values and milliequivalents per 100 grams were obtained on the basis of ovendry soil material.

For data in table 8, the official Soil Conservation Service pipette method of analysis (*8*) was used to determine particle-size distribution. Organic matter was destroyed by treating with hydrogen peroxide and heating. Sodium hexametaphosphate was used as the dispersing agent. The sand fractions were determined by mechanical sieving through nested sieves. The pipette method of analysis was used on the material less than 2 millimeters in diameter. The amount of material larger than 2 millimeters is expressed on the basis of the total weight of the air-dry sample. The sand, silt, and clay fractions are expressed on the basis of the ovendry soil less than 2 millimeters in diameter.

Climate[7]

The survey area is just west of the Tushar Mountains in the eastern part of Beaver County. Several topographic features have a marked influence on the prevailing climate. Between the Mineral Mountains and Tushar Mountains is a small valley in which is the town of Cove Fort and a larger valley in which is the town of Beaver. The northwestern part of the survey area opens out onto the relatively flat plateau that forms the western desert of the State. These two valleys form a basin in which the air accumulates that has been cooled by the adjacent mountains in winter. As a result some of the lowest temperatures in the area occur in these two valleys. In winter the more open terrain to the northwest has minimum temperatures that average about 3° warmer than the valleys. In most winters several days when the minimum temperature is below zero are recorded, and the maximum temperatures in summer range, on the average, between the mid-80's and the mid-90's.

The average length of the growing season is similarly influenced by the topographic features of the area. It lasts for 100 to 120 days in the valleys and is

[7] By E. ARLO RICHARDSON, climatologist for Utah, National Weather Service, U.S. Department of Commerce.

properties of selected soils—Continued

Organic matter—Continued		Electrical conductivity	$CaCO_3$ equivalent	Moisture tension		Cation exchange capacity	Exchangeable sodium percentage
Nitrogen	Carbon-nitrogen ratio			1/3 atmosphere	15 atmospheres		
Percent		*Mmhos per cm at 25° C*	*Percent*	*Percent*	*Percent*	*Meq per 100 gm of soil*	
0.238	14.1	0.95	----------	34.5	12.7	29.5	1
.110	11.4	.71	----------	30.4	14.4	30.3	1
----------	----------	.46	----------	31.7	14.9	30.4	1
----------	----------	.50	6.6	33.5	15.9	30.4	1
----------	----------	.95	7.3	33.8	14.9	27.0	3
.090	13.1	.81	----------	13.1	6.2	14.5	1
.065	13.2	.63	1.0	16.7	8.1	17.0	1
.048	11.9	.55	----------	16.3	7.9	14.6	1
----------	----------	.52	----------	16.8	8.1	15.7	1
----------	----------	.63	----------	15.5	6.8	13.1	1
----------	----------	.68	2.1	12.2	5.5	10.6	1
----------	----------	.40	----------	4.6	2.7	5.28	2
.081	12.7	.51	----------	23.4	10.3	21.5	1
.082	12.3	.44	----------	23.9	13.0	25.9	1
.073	11.4	.39	----------	25.5	13.6	25.8	1
----------	----------	.49	----------	25.4	12.3	22.6	1
----------	----------	.50	19.9	27.0	13.9	18.8	1
----------	----------	.60	36.3	26.5	12.4	14.9	4
----------	----------	1.62	30.3	19.1	9.3	11.9	13
----------	----------	4.90	7.5	7.6	5.8	8.1	21
.128	14.5	.50	----------	23.1	9.8	18.9	1
.055	12.0	.56	----------	22.0	10.6	17.3	1
----------	----------	.43	----------	24.7	13.3	21.4	1
----------	----------	.56	----------	21.7	12.1	19.5	1

more than 140 days in the flat plateau in the northwest but decreases to less than 80 days in the mountains. The growing season is defined as the number of days between the average last date when the temperature was 32° or lower in spring and the average first date in fall.

Precipitation in the area shows marked seasonal variations. Two maximums are observed, one in winter and the other in summer. The winter maximum is associated with storm fronts which sweep across the area from the Pacific Ocean, but the summer maximum is associated with the northward flow of warm moist air from the Gulf of Mexico.

This moist air is quite unstable, and the lifting over the mountains stimulates the development of thunderstorm activity. Average annual precipitation, including rainfall plus the water equivalent of snowfall, is 12 inches or less in the valleys but increases to 24 inches or more in the mountains. Winter precipitation is usually about 60 percent of the normal annual accumulation. The greatest annual amount recorded since 1889 occurred in 1920 when 21.20 inches was reported at the Beaver climate station, which is in a valley.

Much of the winter moisture falls in the form of snow, and the amounts vary greatly. Table 9 on page 136 shows temperature and precipitation at Cove Fort and Beaver. It shows that Beaver averages about 43 inches of snow a year and Cove Fort 73 inches. In general, the snowfall increases with increasing elevation and may exceed 300 inches a year at some of the higher elevations in the mountains. Even in the lower valleys, more than 100 inches has been recorded. Beaver reported 142.7 inches during 1920.

Winds are extremely variable, depending mainly on local topography. Near the mountain slopes, the prevailing winds are generally associated with the differential heating of the slopes. They blow upslope during the day when heating takes place and downslope during the night when cooling takes place. Away from the mountains the normal pressure gradient determines the direction of the prevailing winds, which is southerly. Near storm fronts or active thunderstorms, the wind velocity may exceed 60 miles per hour, but generally it averages less than 10 miles per hour.

In summary, the climate of the area is continental. There is adequate sunshine and only a limited amount of cloudiness.

Water Supply

The water supply for irrigation is derived principally from the watersheds of the Tushar Mountains to the east. Irrigation water is plentiful in spring when

TABLE 8.—*Mechanical analyses of selected soils*

[Analyses made by the Soil Conservation Service and the Utah State University Cooperative Soil Laboratory, Logan, Utah. Dashes indicate that no determination was made]

Soil name	Horizon	Depth from surface	Very coarse sand (2–1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.05 mm)	Silt (0.05–0.002 mm)	Clay (less than 0.002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Antelope Springs silt loam, low lime subsoil variant.	A21	0–¾	0.6	2.8	3.0	7.8	27.7	50.8	7.3
	A22	¾–1½	.8	2.1	2.4	5.6	16.8	56.6	15.7
	A2B2	1½–4	1.6	3.1	3.4	7.1	14.9	49.6	20.3
	B21t	4–7	2.3	7.4	7.4	11.9	11.9	30.3	28.8
	B22t	7–14	1.6	4.3	4.2	8.8	12.1	40.9	28.1
	C1	14–32	2.2	7.9	10.0	21.8	17.7	24.9	15.5
	IIC2	32–40	1.1	2.7	3.0	6.2	7.1	45.7	34.2
	IIIC3	40–60	.6	2.1	1.9	9.3	20.7	49.1	16.3
Blackett coarse sandy loam	A11	0–2	4.6	10.9	7.3	13.1	17.6	32.8	13.6
	A12	2–9	6.3	11.1	7.2	12.3	14.4	31.7	17.0
	C1ca	9–40	5.2	10.7	6.8	12.0	11.3	32.0	22.0
	C2ca	40–56	2.5	5.4	4.1	12.6	20.1	45.9	9.4
	C3	56–70	—	—	—	—	—	—	—
Chipman silty clay loam	A11	0–6	.3	1.0	1.4	3.9	5.7	59.9	27.8
	A12	6–20	.1	.8	1.3	4.6	7.4	56.0	29.8
	C1ca	20–30	.2	.7	1.5	5.2	7.7	51.7	33.0
	C2	30–40	.5	1.3	3.1	11.5	16.9	48.6	18.1
	C3	40–60	.2	.9	2.5	11.5	16.3	44.8	23.8
Clegg loam	A1	0–10	3.3	8.1	6.4	12.2	18.7	34.4	16.9
	B1	10–21	4.7	8.0	4.9	10.6	13.4	36.2	22.2
	B2t	21–28	2.1	6.0	5.2	9.9	18.3	35.9	22.6
	B3ca	28–32	1.6	4.8	5.5	12.2	17.3	37.6	21.0
	C1ca	32–54	1.6	8.0	9.2	17.5	19.2	32.3	12.2
	C2ca	54–56	1.4	5.0	6.5	15.2	20.5	38.2	13.2
Cowers coarse sandy loam	A1	0–10	13.6	10.9	4.1	5.9	9.5	40.1	15.9
	B2	10–21	11.5	12.7	4.9	6.5	10.0	36.7	17.7
	B3	21–33	13.7	14.1	5.9	8.1	10.8	33.5	13.9
	C	33–70	8.2	13.3	6.7	9.7	13.7	37.7	10.7
Decca loam	A1	0–4	2.6	7.0	6.1	12.0	21.3	38.3	12.7
	B2t	4–10	2.6	5.4	5.1	14.0	21.1	27.7	24.1
	B3ca	10–15	3.1	4.5	4.7	17.7	22.9	29.4	17.7
	C1ca	15–20	14.1	13.1	6.0	11.5	12.7	25.3	17.3
	IIC2	20–36	17.4	32.2	19.4	15.6	4.9	7.3	3.2
Etta loam	A1p	0–3	3.6	7.0	5.5	9.1	10.4	37.4	27.0
	A12	3–13	4.0	8.4	5.8	8.9	9.5	35.8	27.6
	C1	13–28	13.4	16.8	11.7	16.1	7.2	14.1	20.7
	C1	28–40	5.5	12.7	8.0	11.2	8.7	29.5	24.4
	C2	40–64	3.7	6.2	3.6	6.1	6.6	38.4	35.4
Flowell loam	A1	0–4	1.5	5.1	5.6	11.7	24.9	31.5	19.7
	B1t	4–10	2.1	5.7	5.2	9.7	20.5	32.1	24.7
	B2t	10–24	1.3	3.9	3.4	7.5	14.6	31.5	37.8
	Cca	24–54	1.9	5.3	5.0	8.8	15.1	40.5	23.4
Fruitland loam	A1p	0–7	1.2	.9	3.8	10.6	19.5	47.0	17.0
	C1	7–23	.5	.7	4.1	14.8	22.9	47.0	10.0
	C2	23–48	.4	.5	2.5	15.9	31.7	42.0	7.0
	C3	48–60	7.5	5.7	14.6	14.5	16.7	28.0	13.0
Hiko Peak cobbly loam	A1	0–2	7.6	9.6	6.0	11.2	12.0	39.8	13.8
	B2	2–9	5.0	8.8	5.7	10.5	11.6	37.9	20.5
	C1ca	9–20	12.4	12.6	6.3	9.7	8.3	28.0	22.7
	C2ca	20–34	17.1	20.3	9.9	13.4	7.8	17.1	14.4
	IIC3	34–60	28.3	25.7	11.2	11.6	5.0	8.8	9.4
James Canyon silty clay loam, heavy variant.	A11	0–7	.4	.4	1.2	3.2	8.8	53.0	33.0
	A12	7–17	.1	.2	.9	3.4	10.4	43.0	42.0
	B2	17–34	0	.3	.3	1.1	3.5	58.9	35.9
	C1	34–40	—	—	—	—	—	—	—
	C2	40–55	1.5	1.3	4.5	8.2	11.5	38.0	35.0

TABLE 8.—*Mechanical analyses of selected soils*—Continued

Soil name	Horizon	Depth from surface	Very coarse sand (2–1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.05 mm)	Silt (0.05–0.002 mm)	Clay (less than 0.002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
James Canyon loam, calcareous variant.	A11	0–4	1.3	1.2	7.3	15.0	12.2	41.0	22.0
	A12	4–16	1.0	1.0	6.8	13.5	11.7	44.0	22.0
	ACca	16–34	1.0	1.1	5.9	9.9	10.1	47.0	25.0
	C	34–60	.8	.6	2.6	10.0	17.0	45.0	24.0
Manderfield loam	AP	0–5	6.8	10.3	5.6	7.6	9.5	40.4	19.8
	B2t	5–16	6.8	9.1	5.6	6.7	8.9	34.9	28.0
	B3	16–24	16.1	13.6	7.0	7.3	7.3	30.2	18.5
	IIC1	24–33	26.2	24.7	13.4	13.4	5.1	8.2	9.0
	IIC1	33–46	27.9	32.9	13.0	7.6	2.5	6.2	9.9
	IIC1	46–60	21.6	37.5	15.2	8.0	2.5	4.7	10.5
Maple Mountain cobbly loam	A1	0–10	9.8	9.6	3.7	4.5	8.5	45.5	18.4
	B21t	10–14	6.2	9.4	4.6	5.5	8.5	35.5	30.3
	B22t	14–33	4.9	10.2	5.7	6.5	8.3	27.4	37.0
	B23t	33–50	7.4	11.1	4.6	5.0	8.9	37.3	25.7
	C	50–60	—	—	—	—	—	—	—
Mill Hollow very cobbly loam	A11	0–2	.2	.7	.8	7.2	20.6	49.7	20.8
	A12	2–7	.4	.7	.8	6.9	21.2	46.5	23.5
	C1ca	7–10	.5	1.7	2.8	7.0	16.1	43.6	28.3
	C2ca	10–14	.5	3.2	4.5	9.5	11.8	37.2	33.3
	C3ca	14–34	.6	3.3	3.7	7.9	9.0	36.3	39.2
Mosida loam	Ap	0–6	.8	.6	2.6	10.0	17.0	49.0	14.0
	C1	6–20	.4	.6	5.4	19.6	23.0	37.0	14.0
	C2	20–48	.3	.4	1.9	11.4	21.0	51.0	14.0
	C3	48–66	1.8	1.6	6.5	14.9	19.2	39.0	17.0
Mud Springs cobbly coarse sandy loam.	A11	0–6	17.8	21.0	11.0	16.1	11.3	16.2	6.6
	A12	6–10	18.6	20.8	10.1	14.8	10.7	17.4	7.6
	B21	10–17	13.7	16.1	8.6	16.9	9.5	23.1	12.1
	B22	17–25	21.1	18.0	7.9	11.3	9.3	23.1	12.1
Mudrock silt loam	Ap	0–4	—	3.6	.8	17.2	5.8	57.9	14.7
	A12	4–9	—	.2	.8	22.4	5.6	57.9	13.1
	C1ca	9–15	—	.3	.6	15.6	11.1	61.2	11.2
	C2ca	15–27	0.2	5.6	1.5	14.0	3.7	58.8	16.2
Pharo very cobbly loam	A11	0–2	6.7	9.2	7.0	15.5	18.7	30.4	12.5
	A12	2–8	4.2	8.0	7.1	16.2	18.5	29.8	16.2
	C1ca	8–29	12.8	14.6	7.7	10.6	13.1	30.9	11.3
	C2ca	29–60	3.9	5.0	2.8	5.4	1.8	57.3	23.8
Poganeab clay loam	A1	0–7	—	.3	.3	1.9	9.7	62.7	25.1
	B2	7–15	—	.2	.2	.9	4.1	64.1	30.5
	C1	15–27	—	.3	.7	4.5	13.8	59.5	21.2
	C2	27–38	.1	1.3	4.2	9.3	14.1	47.8	23.2
	IIC3	38–60	.3	.5	1.0	3.0	9.2	49.6	36.4
Red Butte very cobbly loam	A1	0–3	4.0	7.1	3.7	5.4	13.8	52.6	13.4
	B1	3–8	1.7	4.3	3.3	5.5	13.7	46.9	24.6
	B2t	8–16	4.2	8.8	5.6	7.4	13.4	32.8	27.8
	C1ca	16–20	12.1	17.8	9.1	11.0	10.4	23.6	16.0
	C2ca	20–60	—	—	—	—	—	—	—
Red Rock silt loam	A11	0–3	1.7	.3	.2	1.6	8.8	66.8	20.6
	A12	3–8	0	.1	.1	.5	3.5	66.2	29.6
	B21	8–18	.1	.1	.1	.4	2.8	67.2	29.3
	B22	18–28	.1	.1	.1	.3	2.2	66.5	30.7
	C	28–46	.2	.4	.1	2.6	1.6	64.7	30.4
Snake Hollow coarse sandy loam	A1	0–4	10.9	16.5	9.5	11.7	11.1	26.6	13.7
	B1	4–9	10.8	19.0	9.2	10.0	8.7	24.5	17.8
	B21	9–12	11.6	16.1	8.4	10.8	11.1	23.8	18.2
	B22	12–21	11.8	14.8	7.6	9.8	12.0	26.4	17.6
	B3	21–27	12.7	18.9	9.4	10.5	11.5	22.3	14.7
	C1	27–35	16.0	19.9	9.9	12.1	10.5	18.3	13.3
	C2	35–66	21.8	33.5	15.9	13.2	4.7	5.4	5.5

TABLE 8.—*Mechanical analyses of selected soils*—Continued

Soil name	Horizon	Depth from surface	Very coarse sand (2–1 mm)	Coarse sand (1–0.5 mm)	Medium sand (0.5–0.25 mm)	Fine sand (0.25–0.10 mm)	Very fine sand (0.10–0.05 mm)	Silt (0.05–0.002 mm)	Clay (less than 0.002 mm)
		Inches	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Ushar loam	A11	0–3	.5	1.2	1.2	3.9	18.1	52.2	22.9
	A12	3–6	.6	1.1	1.2	3.8	16.7	51.6	25.0
	B1	6–9	.4	1.4	1.5	4.7	15.2	47.1	29.8
	B21	9–20	1.5	2.5	2.7	7.5	23.8	31.0	25.0
	B22ca	20–23	2.0	3.6	3.1	7.6	20.9	36.6	26.2
	C1ca	23–31	2.2	5.3	4.1	8.9	18.9	39.6	21.0
	C2ca	31–51	10.4	15.4	9.0	11.3	12.4	25.0	16.5
	C3	51–60	32.9	32.5	11.5	6.9	3.3	6.1	6.8

TABLE 9.—*Temperature and precipitation data*

COVE FORT; ELEVATION 5,700 FEET

Month	Temperature				Precipitation			
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Average depth of snowfall
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—	
	°F	°F	°F	°F	Inches	Inches	Inches	Inches
January	42.8	12.8	56	−11	0.96	0.05	1.87	17.2
February	44.7	15.4	59	−6	1.40	.19	3.64	21.5
March	49.1	20.9	64	5	1.50	.26	3.01	14.5
April	50.8	28.6	75	17	1.45	.44	2.95	2.1
May	70.4	36.3	84	25	1.13	(1)	2.23	0
June	82.2	43.2	93	34	.70	0	2.39	0
July	91.0	52.7	97	43	.67	(1)	2.01	0
August	88.1	51.5	95	41	1.03	(1)	2.68	0
September	80.9	42.5	90	29	.69	0	2.27	0
October	69.6	32.2	82	21	.89	0	3.12	.4
November	53.4	21.0	68	1	1.13	.02	2.97	7.6
December	44.7	14.9	57	−5	.97	.29	1.98	10.0
Year	64.8	31.0			12.52			73.3
BEAVER; ELEVATION 5,860 FEET								
January	40.7	13.1	56	−3	0.86	0.10	1.69	8.7
February	43.7	17.5	60	0	.98	.21	1.86	8.3
March	51.8	23.5	65	6	1.06	.16	2.41	6.9
April	61.3	29.6	75	19	.99	.18	2.40	3.8
May	70.4	36.2	83	26	.96	.10	2.31	1.4
June	80.7	43.0	92	33	.65	(1)	1.41	(1)
July	86.9	50.5	95	43	1.25	.22	2.44	0
August	84.6	49.5	93	40	1.44	.30	2.84	(1)
September	77.9	40.6	90	30	.77	.04	2.44	0
October	65.9	30.2	81	21	.99	(1)	2.59	1.1
November	52.6	20.5	66	6	.61	.07	1.40	5.0
December	42.9	14.9	59	1	.79	.15	1.90	8.2
Year	63.3	30.8			11.35			43.4

[1] Trace.

runoff is generally high, but by midsummer it is in short supply. There are a few small reservoirs that do not meet the demand for storage in summer and early in fall. Minersville Reservoir stores the winter water supply, but the water is also used to irrigate land outside the survey area.

The principal streams are Beaver River, North Creek, South Creek, and Pine Creek. These streams have been diverted to supply water, but South Creek is often dry in summer. The water supply varies considerably from spring to summer and, during spring and early in summer, from night to morning.

Land preparation, water control structures, and proper management of water are needed for successful farming, but the fluctuation of the water supply makes proper management of irrigation water difficult. In some years little or no hay is produced for the third crop because of the short water supply.

Water pumped from wells in the area has helped to supply water during the summer shortage, but it is not sufficient to meet the needs of the crops. Excess water applied in spring is the major cause of wet pasture-land. All of the irrigation water is of good quality.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali soil. Generally, a highly alkaline soil. Specifically, an alkali soil has 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 the growth of most crop plants is low from this cause.

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradient lessens abruptly.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water capacity (also termed 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 capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

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.

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.

Cobblestone. A rounded or partly rounded fragment of rock, 3 to 10 inches in diameter.

Complex, soil. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

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 and brittle; little affected by moistening.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, 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 different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has been allowed to drain

away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of 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 these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Distintegrated and partly weathered rock from which soil has formed.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as *follows: very slow*—less than 0.06 inch per hour, *slow*—0.06 to 0.2, *moderately slow*—0.2 to 0.6, *moderate*—0.6 to 2.0, *moderately rapid*—2.0 to 6.0, *rapid*—6.0 to 20.0, and *very rapid*—more than 20.0.

pH value. A numerical means for designating acidity and alkalinity in soils. A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity.

Profile soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Saline soil. A soil that contains soluble salts in amounts that impair growth of plants but that does not contain excess exchangeable sodium.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slope classes. The following slope classes are used in this soil survey: *nearly level*—0 to 1 percent, *gently sloping*—1 to 3 percent, *moderately sloping*—3 to 6 percent, *strongly sloping*—6 to 10 percent, *moderately steep*—10 to 16 percent, *steep*—16 to 30 percent, and *very steep*—more than 30 percent.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that 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.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes 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 other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. 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 together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water supplying capacity. The capacity of a soil to supply water that is stored during periods of plant dormancy and is accumulated during the growing season.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone. In this soil survey, reference to a moderately deep water table means that the water table is within a depth of 20 to 36 inches from the surface during part of the growing season. Reference to a shallow water table means that the water table is at the surface during part of the growing season.

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site Name	Range site Page
YAC	Yardley loam, 1 to 6 percent slopes-----	62	-----	--	IVe-M	66	Mountain Loam	79
YME	Yardley-Maple Mountain association, 1 to 25 percent slopes----------	62	-----	--	-----	--	Mountain Loam	79
	Yardley soil----------	--	-----	--	IVe-M	66	----------	--
	Maple Mountain soil----------	--	-----	--	VIe-M	67	----------	--
YWF	Yardley-Wallsburg association, 3 to 30 percent slopes----------	62	-----	--	-----	--	----------	--
	Yardley soil----------	--	-----	--	VIe-M	67	Mountain Gravelly Loam	79
	Wallsburg soil----------	--	-----	--	VIIs-M	69	Mountain Shallow Loam	80
	Rock outcrop----------	--	-----	--	VIIIs-X	70	----------	--

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site Name	Range site Page
UMF2	Ushar rocky loam, 5 to 30 percent slopes, eroded	58	-----	--	-----	--	----------	--
	Ushar soil	--	-----	--	VIIs-U	70	Upland Loam (Juniper-Pinyon)	77
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
UND	Ushar-Etta association, 3 to 10 percent slopes	59	-----	--	IVe-UZ	67	Upland Loam	76
UOD2	Ushar-Mill Hollow association, 1 to 10 percent slopes, eroded	59	-----	--	IVe-UZ	67	----------	--
	Ushar soil	--	-----	--	-----	--	Upland Loam (Juniper-Pinyon)	77
	Mill Hollow soil	--	-----	--	-----	--	Upland Limy Loam	74
UOF2	Ushar-Mill Hollow association, 10 to 30 percent slopes, eroded	59	-----	--	-----	--	----------	--
	Ushar soil	--	-----	--	VIIs-U	70	Upland Loam (Juniper-Pinyon)	77
	Mill Hollow soil	--	-----	--	VIIs-U	70	Upland Limy Loam	74
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
URF	Ushar-Mosida association, 3 to 30 percent slopes	59	-----	--	-----	--	----------	--
	Ushar soil	--	-----	--	VIIs-U	70	Upland Loam (Juniper-Pinyon)	77
	Mosida soil	--	-----	--	IVe-UZ	67	Upland Loam	76
USF	Ushar-Murdock association, 3 to 25 percent slopes	59	-----	--	VIe-U	67	----------	--
	Ushar soil	--	-----	--	-----	--	Upland Loam (Juniper-Pinyon)	77
	Murdock soil	--	-----	--	-----	--	Upland Shallow Hardpan (Juniper-Pinyon)	78
UTF2	Ushar-Phage association, 3 to 30 percent slopes, eroded	59	-----	--	VIe-U	67	----------	--
	Ushar soil	--	-----	--	-----	--	Upland Loam (Juniper-Pinyon)	77
	Phage soil	--	-----	--	-----	--	Upland Stony Loam (Juniper-Pinyon)	79
UTG2	Ushar-Phage association, 30 to 70 percent slopes, eroded	60	-----	--	VIIe-U	69	----------	--
	Ushar soil	--	-----	--	-----	--	Upland Loam (Juniper-Pinyon)	77
	Phage soil	--	-----	--	-----	--	Upland Stony Loam (Juniper-Pinyon)	79
WBG2	Wallsburg very cobbly loam, 30 to 60 percent slopes, eroded	61	-----	--	VIIs-M	69	Mountain Shallow Loam	80
WCG2	Wallsburg association, 30 to 60 percent slopes, eroded	61	-----	--	-----	--	----------	--
	Wallsburg soil	--	-----	--	VIIs-M	69	Mountain Shallow Loam	80
	Flowell soil	--	-----	--	VIIe-M	68	Mountain Gravelly Loam	79
WMG2	Wallsburg-Maple Mountain association, 3 to 60 percent slopes, eroded	61	-----	--	-----	--	----------	--
	Wallsburg soil	--	-----	--	VIIs-M	69	Mountain Shallow Loam	80
	Maple Mountain soil	--	-----	--	VIIe-M	68	Mountain Loam	79
Wt	Wet alluvial land	61	-----	--	VIw-2	68	Wet Stream Bottoms	81

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site Name	Range site Page
SDF	Sheeprock gravelly coarse sandy loam, 10 to 25 percent slopes	54	-----	--	VIIs-U	70	Upland Sand (Juniper-Pinyon)	77
SEF	Sheeprock-Cokel complex, 3 to 30 percent slopes	54	-----	--	VIIs-U	70	----------	--
	Sheeprock soil	--	-----	--	-----	--	Upland Sand (Juniper-Pinyon)	77
	Cokel soil	--	-----	--	-----	--	Upland Limy Loam (Juniper-Pinyon)	75
SFF	Sheeprock-Ushar complex, 3 to 30 percent slopes	54	-----	--	-----	--	----------	--
	Sheeprock soil	--	-----	--	VIIs-U	70	Upland Sand (Juniper-Pinyon)	77
	Ushar soil	--	-----	--	VIIs-U	70	Upland Loam (Juniper-Pinyon)	77
	Shale outcrop	--	-----	--	VIIIs-X	70	----------	--
SHF	Shotwell very rocky loam, 10 to 30 percent slopes	55	-----	--	-----	--	----------	--
	Shotwell soil	--	-----	--	VIIs-S	69	Semidesert Shallow Loam (8- to 10-inch precipitation zone)	73
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
SKE	Sigurd gravelly loam, 3 to 15 percent slopes	55	-----	--	VIIs-S	69	Semidesert Stony Loam	72
SLD	Snake Hollow coarse sandy loam, 3 to 10 percent slopes	56	-----	--	VIe-U	67	Upland Gravelly Loam	76
SLD2	Snake Hollow coarse sandy loam, 3 to 10 percent slopes, eroded	56	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
SNE3	Snake Hollow-Blackett association, 3 to 20 percent slopes, severely eroded	56	-----	--	VIe-U	67	----------	--
	Snake Hollow soil	--	-----	--	-----	--	Upland Stony Loam (Juniper-Pinyon)	79
	Blackett soil	--	-----	--	-----	--	Upland Limy Loam (Juniper-Pinyon)	75
SOD	Snake Hollow-Blue Star association, 3 to 10 percent slopes	56	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
SRF	Snake Hollow very rocky loam, gravelly subsoil variant, 10 to 30 percent slopes	57	-----	--	-----	--	----------	--
	Snake Hollow soil	--	-----	--	VIIs-U	70	Upland Stony Hills (Juniper-Pinyon)	78
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
UAD2	Ushar sandy loam, 3 to 10 percent slopes, eroded	58	-----	--	IVe-UZ	67	Upland Loam	76
UHC3	Ushar loam, 1 to 6 percent slopes, severely eroded	58	-----	--	VIe-U	67	Upland Loam (Juniper-Pinyon)	77
UHD	Ushar loam, 3 to 10 percent slopes	58	IIIe-26	65	IVe-UZ	67	Upland Loam	76
UHD2	Ushar loam, 3 to 10 percent slopes, eroded	58	-----	--	IVe-UZ	67	Upland Loam (Juniper-Pinyon)	77
ULF2	Ushar cobbly loam, 3 to 30 percent slopes, eroded	58	-----	--	VIe-U	67	Upland Loam (Juniper-Pinyon)	77

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site Name	Range site Page
PVF	Pharo very cobbly loam, 3 to 30 percent slopes	49	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
PWF2	Pharo-Ushar association, 3 to 30 percent slopes, eroded	49	-----	--	-----	--	----------	--
	Pharo soil	--	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
	Ushar soil	--	-----	--	IVe-UZ	67	Upland Loam (Juniper-Pinyon)	77
PxB	Poganeab clay loam, 1 to 3 percent slopes	50	Vw-27	66	-----	--	----------	--
PyB	Poganeab clay loam, deep over clay, 1 to 3 percent slopes	50	Vw-27	66	-----	--	----------	--
RBG2	Red Butte very cobbly loam, 3 to 50 percent slopes, eroded	51	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
RCG2	Red Butte very rocky loam, 30 to 50 percent slopes, eroded	51	-----	--	-----	--	----------	--
	Red Butte soil	--	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
RDG2	Red Butte association, 3 to 60 percent slopes, eroded	51	-----	--	VIIs-U	70	----------	--
	Red Butte soil	--	-----	--	-----	--	Upland Stony Loam (Juniper-Pinyon)	79
	McQuarrie soil	--	-----	--	-----	--	Upland Stony Hills (Juniper-Pinyon)	78
REG2	Red Butte-Deer Creek association, 30 to 50 percent slopes, eroded	51	-----	--	-----	--	----------	--
	Red Butte soil	--	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
	Deer Creek soil	--	-----	--	VIIs-U	70	Upland Loam (Juniper-Pinyon)	77
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
RFF2	Red Butte-Flowell association, 3 to 30 percent slopes, eroded	51	-----	--	VIIs-U	70	----------	--
	Red Butte soil	--	-----	--	-----	--	Upland Stony Loam (Juniper-Pinyon)	79
	Flowell soil	--	-----	--	-----	--	Upland Loam (Juniper-Pinyon)	77
RGF2	Red Butte-Phage association, 3 to 30 percent slopes, eroded	52	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
RhB	Red Rock silt loam, 1 to 3 percent slopes	52	-----	--	IVe-UZ	67	Upland Loam	76
RK	Riverwash	52	-----	--	VIIIw-4	70	----------	--
RLE	Rob Roy loam, 1 to 15 percent slopes	53	-----	--	VIe-U	67	Upland Loam	76
RMF	Rob Roy very cobbly loam, 10 to 30 percent slopes	53	-----	--	VIIs-U	70	Upland Loam	76
RNF	Rob Roy very rocky loam, 10 to 30 percent slopes	53	-----	--	-----	--	----------	--
	Rob Roy soil	--	-----	--	VIIs-U	70	Upland Loam	76
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
RO	Rock land	53	-----	--	VIIIs-X	70	----------	--
SCC	Sheeprock coarse sandy loam, 2 to 6 percent slopes	54	-----	--	VIIs-U	70	Upland Sand (Juniper-Pinyon)	77

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site Name	Range site Page
PFG	Pavant extremely rocky loam, 30 to 40 percent slopes	45	-----	--	-----	--	----------	--
	Pavant soil	--	-----	--	VIIs-U	70	Upland Shallow Hardpan (Juniper-Pinyon)	78
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
PGB	Penoyer silt loam, 1 to 3 percent slopes	46	-----	--	VIIe-S	68	Semidesert Silt Loam	74
PHD	Penoyer-Hiko Peak association, 1 to 10 percent slopes	46	-----	--	-----	--	----------	--
	Penoyer soil	--	-----	--	VIIe-S	68	Semidesert Silt Loam	74
	Hiko Peak soil	--	-----	--	VIIs-S	69	Semidesert Stony Loam	72
PID2	Phage loam, 3 to 10 percent slopes, eroded	47	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
PkD2	Phage gravelly loam, 3 to 10 percent slopes, eroded	47	IVe-24	66	VIe-U	67	Upland Gravelly Loam	76
PLF2	Phage cobbly loam, 3 to 30 percent slopes, eroded	47	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
PLG2	Phage cobbly loam, 30 to 50 percent slopes, eroded	47	-----	--	VIIe-U	69	Upland Stony Loam (Juniper-Pinyon)	79
PMF2	Phage very cobbly loam, 3 to 30 percent slopes, eroded	47	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
PNG2	Phage very rocky loam, 30 to 60 percent slopes, eroded	47	-----	--	-----	--	----------	--
	Phage soil	--	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
POF2	Phage-Black Ridge association, 3 to 30 percent slopes, eroded	47	-----	--	-----	--	----------	--
	Phage soil	--	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
	Black Ridge soil	--	-----	--	VIIs-U	70	Upland Shallow Hardpan (Juniper-Pinyon)	78
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
PPF2	Phage-Pass Canyon association, 3 to 30 percent slopes, eroded	48	-----	--	-----	--	----------	--
	Phage soil	--	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
	Pass Canyon soil	--	-----	--	VIIs-U	70	Upland Stony Hills (Juniper-Pinyon)	78
PRF2	Phage-Red Butte association, 3 to 30 percent slopes, eroded	48	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
PSF2	Phage-Ushar complex, 3 to 30 percent slopes, eroded	48	-----	--	VIe-U	67	----------	--
	Phage soil	--	-----	--	-----	--	Upland Stony Loam (Juniper-Pinyon)	79
	Ushar soil	--	-----	--	-----	--	Upland Loam (Juniper-Pinyon)	77
PtB	Pharo loam, 1 to 3 percent slopes	49	IIIs-24	65	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
PtD	Pharo loam, 3 to 10 percent slopes	49	IVe-24	66	VIe-U	67	Upland Gravelly Loam	76
PUD2	Pharo loam, 3 to 10 percent slopes, eroded	49	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site Name	Range site Page
MPG	Mineral Mountain extremely rocky loam, 30 to 60 percent slopes	38	-----	--	-----	--	----------	--
	Mineral Mountain soil	--	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
MRG2	Mineral Mountain-Snake Hollow association, 3 to 60 percent slopes, eroded	38	-----	--	-----	--	----------	--
	Mineral Mountain soil	--	-----	--	VIIs-U	70	Upland Stony Loam (Juniper-Pinyon)	79
	Snake Hollow soil	--	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
MSE	Mineral Mountain very cobbly loam, gravelly subsoil variant, 2 to 20 percent slopes	39	-----	--	VIIs-M	69	Mountain Stony Loam	81
MSG2	Mineral Mountain very cobbly loam, gravelly subsoil variant, 40 to 60 percent slopes, eroded	39	-----	--	VIIs-M	69	Mountain Stony Loam	81
MT	Mine wash	40	-----	--	VIIIs-X	70	----------	--
MuB	Mosida loam, 1 to 3 percent slopes	40	IIe-26	64	IVe-UZ	67	Upland Loam	76
MuC	Mosida loam, 3 to 6 percent slopes	40	IIIe-26	65	IVe-UZ	67	Upland Loam	76
MuC2	Mosida loam, 1 to 6 percent slopes, eroded	40	-----	--	IVe-UZ	67	Upland Loam	76
MVC3	Mosida loam, 1 to 6 percent slopes, severely eroded	41	-----	--	VIe-U	67	Upland Loam	76
MwC	Mosida loam, gravelly substratum, 1 to 6 percent slopes	41	-----	--	IVe-UZ	67	Upland Loam	76
MXF	Mud Springs extremely rocky coarse sandy loam, 30 to 40 percent slopes	41	-----	--	-----	--	----------	--
	Mud Springs soil	--	-----	--	VIIs-M	69	Mountain Shallow Loam	80
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
MYB	Murdock silt loam, 1 to 3 percent slopes	42	IIIe-23	65	VIe-U	67	Upland Shallow Hardpan (Juniper-Pinyon)	78
MZF2	Murdock-Flowell association, 1 to 30 percent slopes, eroded	42	-----	--	VIe-U	67	----------	--
	Murdock soil	--	-----	--	-----	--	Upland Shallow Hardpan (Juniper-Pinyon)	78
	Flowell soil	--	-----	--	-----	--	Upland Loam (Juniper-Pinyon)	77
OAB	Oasis loam, 1 to 3 percent slopes	43	-----	--	VIIs-S8	69	Semidesert Alkali Flats	72
PAD	Paice cobbly loam, 3 to 10 percent slopes	44	-----	--	VIe-M	67	Mountain Loam	79
PBF3	Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, severely eroded	44	-----	--	VIIs-U	70	Upland Stony Hills (Juniper-Pinyon)	78
PCF2	Pass Canyon very rocky coarse sandy loam, 5 to 30 percent slopes, eroded	44	-----	--	-----	--	----------	--
	Pass Canyon soil	--	-----	--	VIIs-U	70	Upland Stony Hills (Juniper-Pinyon)	78
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
PEC	Pavant cobbly loam, 1 to 6 percent slopes	45	-----	--	VIIs-U	70	Upland Shallow Hardpan (Juniper-Pinyon)	78
PdB	Pavant silt loam, 1 to 3 percent slopes	45	IVe-23	65	VIIs-U	70	Upland Shallow Hardpan (Juniper-Pinyon)	78

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site Name	Range site Page
KPE	Kessler-Penoyer association, 1 to 20 percent slopes	33	-----	--	-----	--	----------	--
	Kessler soil	--	-----	--	VIIs-S	69	Semidesert Limy Loam	73
	Hiko Peak soil	--	-----	--	VIIs-S	69	Semidesert Stony Loam	72
	Penoyer soil	--	-----	--	VIIe-S	68	Semidesert Silt Loam	74
MaB	Manderfield loam, 1 to 3 percent slopes	33	IIIs-24	65	VIs-U	68	Upland Stony Loam	76
MaC	Manderfield loam, 3 to 6 percent slopes	33	IIIs-24	65	VIs-U	68	Upland Stony Loam	76
MBB2	Manderfield loam, 1 to 3 percent slopes, eroded	33	-----	--	VIs-U	68	Upland Stony Loam	76
McB	Manderfield loam, moderately deep over gravel, 1 to 3 percent slopes	34	IIIs-24	65	-----	--	----------	--
MdB	Manderfield gravelly loam, 1 to 3 percent slopes	34	IVs-24	66	VIs-U	68	Upland Stony Loam	76
MeC	Manderfield cobbly loam, 1 to 6 percent slopes	34	IVs-24	66	VIs-U	68	Upland Stony Loam	76
MFC2	Manderfield cobbly loam, 1 to 6 percent slopes, eroded	34	-----	--	VIs-U	68	Upland Stony Loam (Juniper-Pinyon)	79
MGG	Maple Mountain cobbly loam, 25 to 50 percent slopes	35	-----	--	VIIe-M	68	Mountain Loam	79
MHG	May Day association, 10 to 60 percent slopes	35	-----	--	-----	--	----------	--
	May Day soil	--	-----	--	VIIs-U	70	Upland Shallow Hardpan (Juniper-Pinyon)	78
	McQuarrie soil	--	-----	--	VIIs-U	70	Upland Stony Hills (Juniper-Pinyon)	78
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
MIE	May Day-Deer Creek association, 3 to 20 percent slopes	35	-----	--	VIIs-U	70	----------	--
	May Day soil	--	-----	--	-----	--	Upland Shallow Hardpan (Juniper-Pinyon)	78
	Deer Creek soil	--	-----	--	-----	--	Upland Loam	76
MKF	McQuarrie rocky loam, 2 to 30 percent slopes	36	-----	--	-----	--	----------	--
	McQuarrie soil	--	-----	--	VIIs-U	70	Upland Stony Hills (Juniper-Pinyon)	78
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
MLF	McQuarrie very cobbly loam, coarse textured subsoil variant, 5 to 30 percent slopes	37	-----	--	VIIs-U	70	Upland Stony Hills (Juniper-Pinyon)	78
MMD	Mill Hollow very cobbly loam, 2 to 10 percent slopes	37	-----	--	VIIs-U	70	Upland Limy Loam	74
MNF	Mill Hollow-Pharo association, 2 to 30 percent slopes	37	-----	--	VIIs-U	70	----------	--
	Mill Hollow soil	--	-----	--	-----	--	Upland Limy Loam	74
	Pharo soil	--	-----	--	-----	--	Upland Stony Loam (Juniper-Pinyon)	79
MOF	Mill Hollow-Ushar association, 3 to 30 percent slopes	38	-----	--	-----	--	----------	--
	Mill Hollow soil	--	-----	--	VIe-U	67	Upland Limy Loam	74
	Ushar soil	--	-----	--	VIe-U	67	Upland Loam (Juniper-Pinyon)	77
	Firmage soil	--	-----	--	VIIs-U	70	Upland Limy Loam (Juniper-Pinyon)	75

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site Name	Range site Page
F1B	Flowell association, 1 to 3 percent slopes	24	-----	--	-----	--	----------	--
	Flowell soil	--	IIIe-25	65	-----	--	----------	--
	Ushar soil	--	IIe-2	64	-----	--	----------	--
FMC2	Flowell association, 3 to 6 percent slopes, eroded	24	-----	--	IVe-UZ	67	Upland Loam (Juniper-Pinyon)	77
FUF	Flowell-Ushar association, 3 to 30 percent slopes	25	-----	--	VIe-U	67	Upland Loam (Juniper-Pinyon)	77
FVF2	Flowell loam, cold variant, 10 to 30 percent slopes, eroded	25	-----	--	VIe-M	67	Mountain Gravelly Loam	79
FWG2	Flowell cobbly loam, cold variant, 30 to 60 percent slopes, eroded	25	-----	--	VIIe-M	68	Mountain Gravelly Loam	79
FxB	Fruitland loam, 1 to 3 percent slopes	26	IIe-26	64	VIIe-S	68	Semidesert Loam	73
FxC	Fruitland loam, 3 to 6 percent slopes	26	IIIe-26	65	VIIe-S	68	Semidesert Loam	73
FZC2	Fruitland loam, 1 to 6 percent slopes, eroded	26	-----	--	VIIe-S	68	Semidesert Loam	73
HAB	Hansel loam, 1 to 3 percent slopes	27	-----	--	IVe-UZ	67	Upland Loam	76
He	Hansel silt loam, low lime variant	27	IIe-2	64	IVe-UZ	67	Upland Loam	76
HHD	Haybourne coarse sandy loam, 1 to 10 percent slopes	28	-----	--	VIIe-S	68	Semidesert Loam	73
HIF	Hiko Peak coarse sandy loam, 3 to 30 percent slopes	29	-----	--	VIIs-S	69	Semidesert Stony Loam	72
HKD	Hiko Peak cobbly loam, 2 to 10 percent slopes	29	-----	--	VIIs-S	69	Semidesert Stony Loam	72
HPE	Hiko Peak-Decca association, 1 to 15 percent slopes	29	-----	--	VIIs-S	69	Semidesert Stony Loam	72
HRE	Hiko Peak-Fruitland association, 1 to 15 percent slopes	29	-----	--	-----	--	----------	--
	Hiko Peak soil	--	-----	--	VIIs-S	69	Semidesert Stony Loam	72
	Fruitland soil	--	-----	--	VIIe-S	68	Semidesert Loam	73
JcB	James Canyon silt loam, 1 to 3 percent slopes	30	Vw-2	66	-----	--	----------	--
JeB	James Canyon silt loam, strongly saline, 1 to 3 percent slopes	30	Vw-27	66	-----	--	----------	--
Jm	James Canyon loam, calcareous variant	30	IIw-2	64	-----	--	----------	--
Jn	James Canyon silty clay loam, heavy variant	31	Vw-2	66	-----	--	----------	--
Jo	James Canyon silty clay loam, heavy variant, saline	31	Vw-27	66	-----	--	----------	--
KCF	Kersick very rocky loam, 5 to 30 percent slopes	32	-----	--	-----	--	----------	--
	Kersick soil	--	-----	--	VIIs-U	70	Upland Stony Hills (Juniper-Pinyon)	78
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
KED	Kessler loam, 1 to 10 percent slopes	32	-----	--	VIIe-S	68	Semidesert Limy Loam	73
KLE	Kessler cobbly loam, 3 to 20 percent slopes	32	-----	--	VIIe-S	68	Semidesert Limy Loam	73
KME	Kessler-Hiko Peak association, 1 to 20 percent slopes	32	-----	--	-----	--	----------	--
	Kessler soil	--	-----	--	VIIs-S	69	Semidesert Limy Loam	73
	Hiko Peak soil	--	-----	--	VIIs-S	69	Semidesert Stony Loam	72
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--

Map symbol	Mapping unit	Page	Capability unit Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site Name	Range site Page
CLF	Clegg very rocky loam, 6 to 30 percent slopes	16	-----	--	-----	--	----------	--
	Clegg soil	--	-----	--	VIe-U	67	Upland Loam	76
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
CME	Cokel coarse sandy loam, 3 to 15 percent slopes	17	-----	--	VIs-U	68	Upland Limy Loam (Juniper-Pinyon)	75
CN	Colluvial land and Shale outcrop	17	-----	--	VIIIs-X	70	----------	--
COF2	Cowers coarse sandy loam, 2 to 30 percent slopes, eroded	17	-----	--	VIe-M	67	Mountain Gravelly Loam	79
CRF2	Cowers association, 2 to 30 percent slopes, eroded	17	-----	--	VIe-M	67	----------	--
	Mineral Mountain soil	--	-----	--	-----	--	Mountain Loam	79
	Cowers soil	--	-----	--	-----	--	Mountain Gravelly Loam	79
CSF2	Cowers-Bearskin association, 2 to 30 percent slopes, eroded	17	-----	--	-----	--	----------	--
	Cowers soil	--	-----	--	VIe-M	67	Mountain Gravelly Loam	79
	Bearskin soil	--	-----	--	VIIs-M	69	Mountain Shallow Loam	80
DaC	Decca gravelly sandy loam, 3 to 6 percent slopes	18	IVs-24	66	VIIs-S	69	Semidesert Stony Loam	72
DCF	Decca cobbly sandy loam, 10 to 30 percent slopes	18	-----	--	VIIs-S	69	Semidesert Stony Loam	72
DeB	Decca loam, 1 to 3 percent slopes	18	IVs-24	66	VIIs-S	69	Semidesert Stony Loam	72
DeC	Decca loam, 3 to 6 percent slopes	19	IVs-24	66	VIIs-S	69	Semidesert Stony Loam	72
DFD	Decca very rocky loam, 2 to 10 percent slopes	19	-----	--	-----	--	----------	--
	Decca soil	--	-----	--	VIIs-S	69	Semidesert Stony Loam	72
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
DHF	Decca-Hiko Peak complex, 1 to 30 percent slopes	19	-----	--	VIIs-S	69	Semidesert Stony Loam	72
DKF2	Deer Creek cobbly loam, 3 to 30 percent slopes, eroded	20	-----	--	VIe-U	67	Upland Loam	76
DLE2	Deer Creek very cobbly loam, 3 to 20 percent slopes, eroded	20	-----	--	VIIs-U	70	Upland Loam	76
DrB	Draper loam, 1 to 3 percent slopes	20	IIw-2	64	-----	--	----------	--
Ds	Draper loam, sandy subsoil variant	21	Vw-2	66	-----	--	----------	--
ECD2	Escalante sandy loam, 2 to 10 percent slopes, eroded	22	-----	--	VIIe-S	68	Semidesert Limy Loam	73
ESD2	Escalante-Hiko Peak complex, 2 to 10 percent slopes, eroded	22	-----	--	VIIe-S	68	----------	--
	Escalante soil	--	-----	--	-----	--	Semidesert Limy Loam	73
	Hiko Peak soil	--	-----	--	-----	--	Semidesert Stony Loam	72
Et	Etta loam	22	IIe-2	64	IVe-UZ	67	Upland Loam	76
Ev	Etta clay, heavy variant	23	IIIe-25	65	IVe-UZ	67	Upland Loam	76
FDF	Firmage-Oakden association, 5 to 30 percent slopes	23	-----	--	VIIs-U	70	----------	--
	Firmage soil	--	-----	--	-----	--	Upland Limy Loam (Juniper-Pinyon)	75
	Oakden soil	--	-----	--	-----	--	Upland Shallow Hardpan (Juniper-Pinyon)	78
FEC2	Flowell loam, 3 to 6 percent slopes, eroded	24	-----	--	IVe-UZ	67	Upland Loam (Juniper-Pinyon)	77
FGC2	Flowell gravelly loam, 3 to 6 percent slopes, eroded	24	-----	--	IVe-UZ	67	Upland Loam (Juniper-Pinyon)	77

GUIDE TO MAPPING UNITS

Soils in the Beaver-Cove Fort Area were mapped at two intensities of detail. Those soils used mainly for farming were mapped at a high intensity of detail, and they are identified by a map symbol composed of both uppercase and lowercase letters. The remaining soils, used mainly for range and as woodland, were mapped at a low intensity of detail. They are identified by a map symbol composed entirely of upper letters. Dashes in the column headed Range site mean that the soil is used mainly for farming. For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which it belongs. For complete information about a capability unit, refer to the section "Management by Capability Units" beginning on page 64. For information about wildlife suitability groups see pages 81 and 82. Other information is given in tables as follows:

Acreage and extent of the soils, table 1, page 8.
Estimated yields, table 2, page 71.

Engineering, tables 3, 4, and 5, pages 84 to 117.

Map symbol	Mapping unit	Page	Capability unit: Irrigated Symbol	Irrigated Page	Nonirrigated Symbol	Nonirrigated Page	Range site: Name	Range site Page
ALD3	Alovar loam, 3 to 10 percent slopes, severely eroded	7	-----	--	VIIe-S	68	Semidesert Silt Loam	74
AND2	Antelope Springs-Kessler association, 1 to 10 percent slopes, eroded	10	-----	--	-----	--	----------	--
	Antelope Springs soil	--	-----	--	VIIs-S8	69	Semidesert Alkali Flats	72
	Kessler soil	--	-----	--	VIIe-S	68	Semidesert Limy Loam	73
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
AS	Antelope Springs silt loam, low lime subsoil variant	11	-----	--	VIIs-S8	69	Semidesert Alkali Flats	72
BCF2	Bearskin-Cowers very rocky association, 2 to 30 percent slopes, eroded	11	-----	--	-----	--	----------	--
	Bearskin soil	--	-----	--	VIIs-M	69	Mountain Shallow Loam	80
	Cowers soil	--	-----	--	VIe-M	67	Mountain Gravelly Loam	79
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
BEF	Bearskin-Cowers extremely rocky association, 2 to 30 percent slopes	12	-----	--	-----	--	----------	--
	Bearskin soil	--	-----	--	VIIs-M	69	Mountain Shallow Loam	80
	Cowers soil	--	-----	--	VIe-M	67	Mountain Gravelly Loam	79
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
BKE	Blackett coarse sandy loam, 3 to 20 percent slopes	12	-----	--	VIe-U	67	Upland Limy Loam (Juniper-Pinyon)	75
BLE	Blackett-Blue Star association, 3 to 20 percent slopes	12	-----	--	VIe-U	67	----------	--
	Blackett soil	--	-----	--	-----	--	Upland Limy Loam (Juniper-Pinyon)	75
	Blue Star soil	--	-----	--	-----	--	Upland Stony Loam (Juniper-Pinyon)	79
BNE2	Blackett-Snake Hollow association, 3 to 20 percent slopes, eroded	12	-----	--	VIe-U	67	----------	--
	Blackett soil	--	-----	--	-----	--	Upland Limy Loam (Juniper-Pinyon)	75
	Snake Hollow soil	--	-----	--	-----	--	Upland Stony Loam (Juniper-Pinyon)	79
BRF	Black Ridge extremely rocky silt loam, 6 to 30 percent slopes	14	-----	--	-----	--	----------	--
	Black Ridge soil	--	-----	--	VIIs-U	70	Upland Shallow Hardpan (Juniper-Pinyon)	78
	Rock outcrop	--	-----	--	VIIIs-X	70	----------	--
BSD	Blue Star cobbly sandy loam, 3 to 10 percent slopes	14	-----	--	VIe-U	67	Upland Stony Loam (Juniper-Pinyon)	79
Ca	Chipman silty clay loam	15	Vw-2	66	-----	--	----------	--
CEF	Clegg loam, 6 to 30 percent slopes	16	-----	--	VIe-U	67	Upland Loam	76
CGF	Clegg cobbly loam, 6 to 30 percent slopes	16	-----	--	VIe-U	67	Upland Loam	76

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BEAVER-COVE FORT AREA, UTAH

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads

- Divided
- Good motor
- Poor motor
- Trail

Highway markers

- National Interstate
- U. S.
- State or county

Railroads

- Single track
- Multiple track
- Abandoned

Bridges and crossings

- Road
- Trail
- Railroad
- Ferry (FY)
- Ford (FORD)
- Grade
- R. R. over
- R. R. under

Buildings

- School
- Church

Mine and quarry

Gravel pit

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

Forest fire or lookout station

Corral

Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canal or ditch, single line irrigation

Lakes and ponds

- Perennial (water, w)
- Intermittent (int)

Spring

Marsh or swamp

Wet spot

Drainage end or alluvial fan

RELIEF

Escarpments

- Bedrock
- Other

Short steep slope

Prominent peak

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Glacial till
- Saline spot

SOIL ASSOCIATIONS

1 — Hiko Peak-Decca-Sheeprock association: Gently sloping to steep, well-drained and somewhat excessively drained, deep soils on alluvial fans, terraces, mountains, and hills of the semiarid uplands

2 — Kessler-Penoyer-Hiko Peak association: Nearly level to steep, well-drained, deep soils on alluvial fans, valleys, mountains, and hills of the semiarid uplands

3 — Phage-Ushar-Red Butte association: Gently sloping to very steep, well-drained and somewhat excessively drained, deep soils on alluvial fans, outwash plains, terraces, hills, and mountains of the dry subhumid uplands

4 — Snake Hollow-Blackett-Blue Star association: Gently sloping to steep, somewhat excessively drained and well-drained, deep soils on alluvial fans and hills of the dry subhumid uplands

5 — Mill Hollow-Ushar-Pharo association: Gently sloping to steep, well-drained and somewhat excessively drained, deep soils on alluvial fans, terraces, hills, and mountains of the dry subhumid uplands

6 — Mosida-Etta-Ushar association: Nearly level to strongly sloping, well-drained, deep soils on alluvial fans and flood plains of the dry subhumid uplands

7 — Pharo-Pass Canyon association: Gently sloping to steep, somewhat excessively drained and well-drained, deep to shallow soils on terraces, hills, ridges, and mountains of the dry subhumid uplands

8 — Shotwell-Firmage-Oakden association: Moderately sloping to steep, well-drained, very shallow to deep soils on hills and mountains of the semiarid and dry subhumid uplands

9 — Black Ridge-Paice association: Moderately sloping to steep, well-drained, shallow and moderately deep soils on plains and hills of the dry subhumid and moist subhumid uplands

10 — Clegg-Deer Creek association: Moderately sloping to very steep, well-drained, deep soils on alluvial fans, hills, and mountains of the moist subhumid uplands

11 — Yardley-Maple Mountain-Wallsburg association: Gently sloping to very steep, well-drained, deep to shallow soils on alluvial fans, ridges, and mountain side slopes and in mountain valleys of the moist subhumid uplands

12 — Rock land-Bearskin-Cowers association: Rock land and gently sloping to very steep, well-drained, shallow to deep soils on ridges, hills, and mountains of the moist subhumid mountains

13 — James Canyon-Draper-Poganeab association: Gently sloping, poorly drained and somewhat poorly drained, deep soils on flood plains, fans, and terraces in semiarid and dry subhumid valleys

Compiled 1973

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

U. S. DEPARTMENT OF THE INTERIOR,
BUREAU OF LAND MANAGEMENT

UTAH AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

BEAVER-COVE FORT AREA
UTAH
PARTS OF BEAVER AND MILLARD COUNTIES

Scale 1:190,080
1 0 1 2 3 4 Miles

N

112°50′ 112°40′ —38°40′ —38°30′ —38°20′ 38°10′—

T. 24 S. T. 25 S. T. 26 S. T. 27 S. T. 28 S. T. 29 S. T. 30 S.

MILLARD COUNTY / BEAVER COUNTY

IRON COUNTY

R. 9 W. R. 8 W. R. 7 W. R. 6 W.

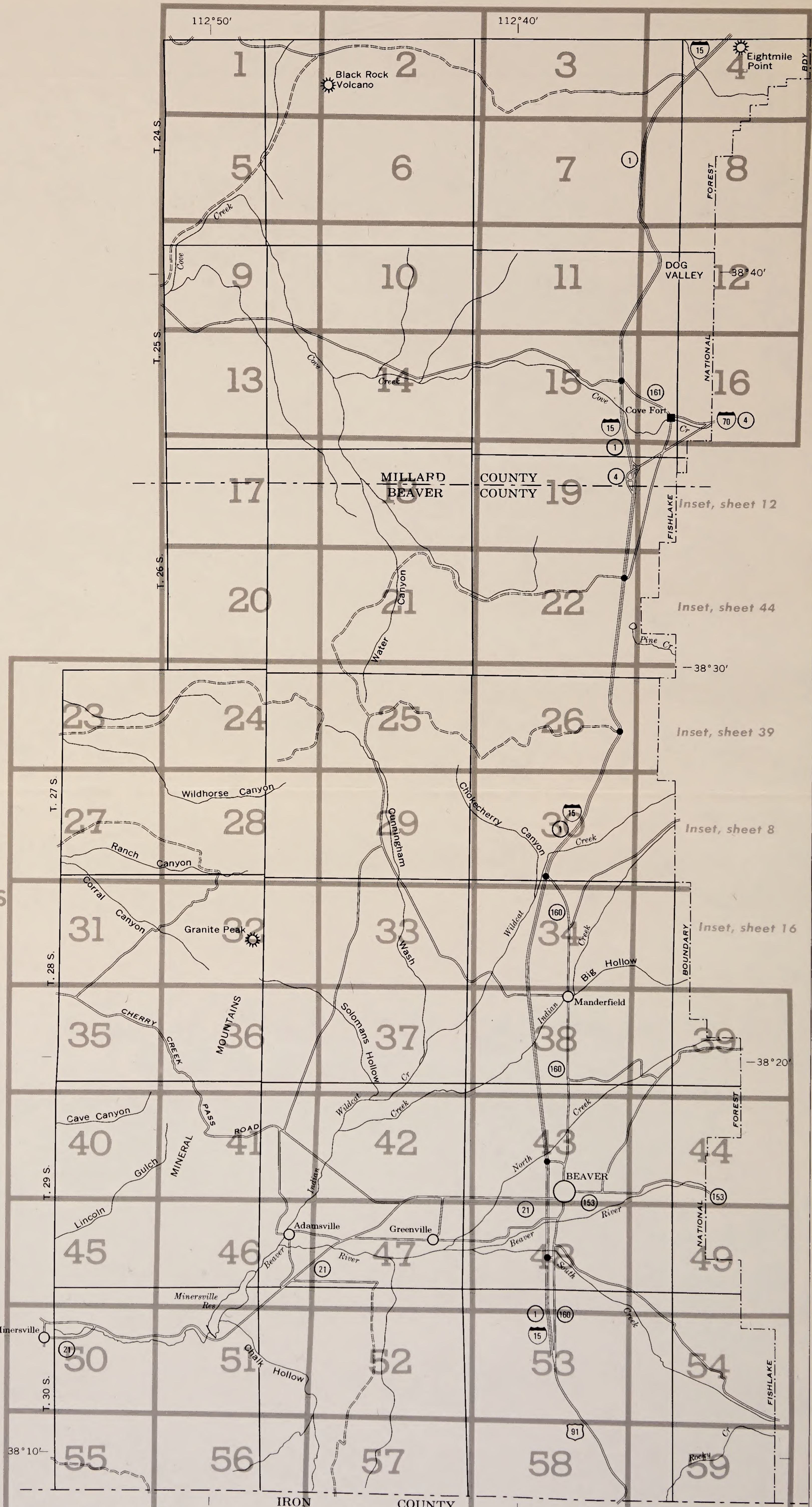
Black Rock Volcano · Eightmile Point · DOG VALLEY · Cove Fort · Granite Peak · Manderfield · BEAVER · Adamsville · Greenville · Minersville · Minersville Res · MINERAL MOUNTAINS · PASS ROAD · FISHLAKE NATIONAL FOREST BDY

Cove Creek · Water Canyon · Wildhorse Canyon · Ranch Canyon · Corral Canyon · Cherry Creek · Cave Canyon · Gulch · Lincoln · Cunningham Wash · Chokecherry Canyon · Creek · Wildcat Creek · Big Hollow · Indian Creek · Solomons Hollow · Chalk Hollow · North Creek · Beaver River · South Creek · Rocky Cr · Pine Cr

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

INDEX TO MAP SHEETS
BEAVER-COVE FORT AREA
UTAH
PARTS OF BEAVER
AND
MILLARD COUNTIES

Scale 1:190,080
1 0 1 2 3 4 Miles



SOIL LEGEND

The first letter, always a capital, is the initial one of the soil name. The second letter is a capital if the mapping unit is one of the low intensity survey; otherwise it is a small letter. The third letter, B, C, D, E, F, or G, shows the slope. Most symbols without a slope letter are for nearly level soils, but some are for land types that have a considerable range in slope. A final number, 2 or 3, in a symbol shows that the soil is eroded or severely eroded.

SYMBOL High Intensity	SYMBOL Low Intensity	NAME
-	ALD3	Alovar loam, 3 to 10 percent slopes, severely eroded
-	AND2	Antelope Springs-Kessler association, 1 to 10 percent slopes, eroded
-	AS	Antelope Springs silt loam, low lime subsoil variant
-	BCF2	Bearskin-Cowers very rocky association, 2 to 30 percent slopes, eroded
-	BEF	Bearskin-Cowers extremely rocky association, 2 to 30 percent slopes
-	BKE	Blackett coarse sandy loam, 3 to 20 percent slopes
-	BLE	Blackett-Blue Star association, 3 to 20 percent slopes
-	BNE2	Blackett-Snake Hollow association, 3 to 20 percent slopes, eroded
-	BRF	Black Ridge extremely rocky silt loam, 6 to 30 percent slopes
-	BSD	Blue Star cobbly sandy loam, 3 to 10 percent slopes
Ca	-	Chipman silty clay loam
-	CEF	Clegg loam, 6 to 30 percent slopes
-	CGF	Clegg cobbly loam, 6 to 30 percent slopes
-	CLF	Clegg very rocky loam, 6 to 30 percent slopes
-	CME	Cokel coarse sandy loam, 3 to 15 percent slopes
-	CN	Colluvial land and Shale outcrop
-	COF2	Cowers coarse sandy loam, 2 to 30 percent slopes, eroded
-	CRF2	Cowers association, 2 to 30 percent slopes, eroded
-	CSF2	Cowers-Bearskin association, 2 to 30 percent slopes, eroded
DaC	-	Decca gravelly sandy loam, 3 to 6 percent slopes
-	DCF	Decca cobbly sandy loam, 10 to 30 percent slopes
DeB	-	Decca loam, 1 to 3 percent slopes
DeC	-	Decca loam, 3 to 6 percent slopes
-	DFD	Decca very rocky loam, 2 to 10 percent slopes
-	DHF	Decco-Hiko Peak complex, 1 to 30 percent slopes
-	DKF2	Deer Creek cobbly loam, 3 to 30 percent slopes, eroded
-	DLE2	Deer Creek very cobbly loam, 3 to 20 percent slopes, eroded
DrB	-	Draper loam, 1 to 3 percent slopes
Ds	-	Draper loam, sandy subsoil variant
-	ECD2	Escalante sandy loam, 2 to 10 percent slopes, eroded
-	ESD2	Escalante-Hiko Peak complex, 2 to 10 percent slopes, eroded
Et	-	Etta loam
Ev	-	Etta clay, heavy variant
-	FDF	Firmage-Oakden association, 5 to 30 percent slopes
-	FEC2	Flowell loam, 3 to 6 percent slopes, eroded
-	FGC2	Flowell gravelly loam, 3 to 6 percent slopes, eroded
FlB	-	Flowell association, 1 to 3 percent slopes
-	FMC2	Flowell association, 3 to 6 percent slopes, eroded
-	FUF	Flowell-Ushar association, 3 to 30 percent slopes
-	FVF2	Flowell loam, cold variant, 10 to 30 percent slopes, eroded
-	FWG2	Flowell cobbly loam, cold variant, 30 to 60 percent slopes, eroded
FxB	-	Fruitland loam, 1 to 3 percent slopes
FxC	-	Fruitland loam, 3 to 6 percent slopes
-	FZC2	Fruitland loam, 1 to 6 percent slopes, eroded
-	HAB	Hansel loam, 1 to 3 percent slopes
He	-	Hansel silt loam, low lime variant
-	HHD	Haybourne coarse sandy loam, 1 to 10 percent slopes
-	HIF	Hiko Peak coarse sandy loam, 3 to 30 percent slopes
-	HKD	Hiko Peak cobbly loam, 2 to 10 percent slopes
-	HPE	Hiko Peak-Decca association, 1 to 15 percent slopes
-	HRE	Hiko Peak-Fruitland association, 1 to 15 percent slopes
JcB	-	James Canyon silt loam, 1 to 3 percent slopes
JeB	-	James Canyon silt loam, strongly saline, 1 to 3 percent slopes
Jm	-	James Canyon loam, calcareous variant
Jn	-	James Canyon silty clay loam, heavy variant
Jo	-	James Canyon silty clay loam, heavy variant, saline
-	KCF	Kersick very rocky loam, 5 to 30 percent slopes
-	KED	Kessler loam, 1 to 10 percent slopes
-	KLE	Kessler cobbly loam, 3 to 20 percent slopes
-	KME	Kessler-Hiko Peak association, 1 to 20 percent slopes
-	KPE	Kessler-Penoyer association, 1 to 20 percent slopes
MaB	-	Manderfield loam, 1 to 3 percent slopes
MaC	-	Manderfield loam, 3 to 6 percent slopes
-	MBB2	Manderfield loam, 1 to 3 percent slopes, eroded
McB	-	Manderfield loam, moderately deep over gravel, 1 to 3 percent slopes
MdB	-	Manderfield gravelly loam, 1 to 3 percent slopes
MeC	-	Manderfield cobbly loam, 1 to 6 percent slopes
-	MFC2	Manderfield cobbly loam, 1 to 6 percent slopes, eroded
-	MGG	Maple Mountain cobbly loam, 25 to 50 percent slopes
-	MHG	May Day association, 10 to 60 percent slopes
-	MIE	May Day-Deer Creek association, 3 to 20 percent slopes
-	MKF	McQuarrie rocky loam, 2 to 30 percent slopes
-	MLF	McQuarrie very cobbly loam, coarse textured subsoil variant, 5 to 30 percent slopes
-	MMD	Mill Hollow very cobbly loam, 2 to 10 percent slopes
-	MNF	Mill Hollow-Phara association, 2 to 30 percent slopes
-	MOF	Mill Hollow-Ushar association, 3 to 30 percent slopes
-	MPG	Mineral Mountain extremely rocky loam, 30 to 60 percent slopes
-	MRG2	Mineral Mountain-Snake Hollow association, 3 to 60 percent slopes, eroded
-	MSE	Mineral Mountain very cobbly loam, gravelly subsoil variant, 2 to 20 percent slopes
-	MSG2	Mineral Mountain very cobbly loam, gravelly subsoil variant, 40 to 60 percent slopes, eroded
-	MT	Mine wash
MuB	-	Mosida loam, 1 to 3 percent slopes
MuC	-	Mosida loam, 3 to 6 percent slopes
MuC2	-	Mosida loam, 1 to 6 percent slopes, eroded
-	MVC3	Mosida loam, 1 to 6 percent slopes, severely eroded
MwC	-	Mosida loam, gravelly substratum, 1 to 6 percent slopes
-	MXF	Mud Springs extremely rocky coarse sandy loam, 30 to 40 percent slopes
-	MYB	Murdock silt loam, 1 to 3 percent slopes
-	MZF2	Murdock-Flowell association, 1 to 30 percent slopes, eroded
-	OAB	Oasis loam, 1 to 3 percent slopes
-	PAD	Paice cobbly loam, 3 to 10 percent slopes
-	PBF3	Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, severely eroded
-	PCF2	Pass Canyon very rocky coarse sandy loam, 5 to 30 percent slopes, eroded
PdB	-	Pavant silt loam, 1 to 3 percent slopes
-	PEC	Pavant cobbly loam, 1 to 6 percent slopes
-	PFG	Pavant extremely rocky loam, 30 to 40 percent slopes
-	PGB	Penoyer silt loam, 1 to 3 percent slopes
-	PHD	Penoyer-Hiko Peak association, 1 to 10 percent slopes
-	PID2	Phage loam, 3 to 10 percent slopes, eroded
PkD2	-	Phage gravelly loam, 3 to 10 percent slopes, eroded
-	PLF2	Phage cobbly loam, 3 to 30 percent slopes, eroded
-	PLG2	Phage cobbly loam, 30 to 50 percent slopes, eroded
-	PMF2	Phage very cobbly loam, 3 to 30 percent slopes, eroded
-	PNG2	Phage very rocky loam, 30 to 60 percent slopes, eroded
-	POF2	Phage-Black Ridge association, 3 to 30 percent slopes, eroded
-	PPF2	Phage-Pass Canyon association, 3 to 30 percent slopes, eroded
-	PRF2	Phage-Red Butte association, 3 to 30 percent slopes, eroded
-	PSF2	Phage-Ushar complex, 3 to 30 percent slopes, eroded
PtB	-	Phoro loam, 1 to 3 percent slopes
PtD	-	Phoro loam, 3 to 10 percent slopes
-	PUD2	Phoro loam, 3 to 10 percent slopes, eroded
-	PVF	Phoro very cobbly loam, 3 to 30 percent slopes
-	PWF2	Phoro-Ushar association, 3 to 30 percent slopes, eroded
PxB	-	Poganeab clay loam, 1 to 3 percent slopes
PyB	-	Poganeab clay loam, deep over clay, 1 to 3 percent slopes
-	RBG2	Red Butte very cobbly loam, 3 to 50 percent slopes, eroded
-	RCG2	Red Butte very rocky loam, 30 to 50 percent slopes, eroded
-	RDG2	Red Butte association, 3 to 60 percent slopes, eroded
-	REG2	Red Butte-Deer Creek association, 30 to 50 percent slopes, eroded
-	RFF2	Red Butte-Flowell association, 3 to 30 percent slopes, eroded
-	RGF2	Red Butte-Phage association, 3 to 30 percent slopes, eroded
RhB	-	Red Rock silt loam, 1 to 3 percent slopes
-	RK	Riverwash
-	RLE	Rob Roy loam, 1 to 15 percent slopes
-	RMF	Rob Roy very cobbly loam, 10 to 30 percent slopes
-	RNF	Rob Roy very rocky loam, 10 to 30 percent slopes
-	RO	Rock land
-	SCC	Sheeprock coarse sandy loam, 2 to 6 percent slopes
-	SDF	Sheeprock gravelly coarse sandy loam, 10 to 25 percent slopes
-	SEF	Sheeprock-Cokel complex, 3 to 30 percent slopes
-	SFF	Sheeprock-Ushar complex, 3 to 30 percent slopes
-	SHF	Shotwell very rocky loam, 10 to 30 percent slopes
-	SKE	Sigurd gravelly loam, 3 to 15 percent slopes
-	SLD	Snake Hollow coarse sandy loam, 3 to 10 percent slopes
-	SLD2	Snake Hollow coarse sandy loam, 3 to 10 percent slopes, eroded
-	SNE3	Snake Hollow-Blackett association, 3 to 20 percent slopes, severely eroded
-	SOD	Snake Hollow-Blue Star association, 3 to 10 percent slopes
-	SRF	Snake Hollow very rocky loam, gravelly subsoil variant, 10 to 30 percent slopes
-	UAD2	Ushar sandy loam, 3 to 10 percent slopes, eroded
-	UHC3	Ushor loam, 1 to 6 percent slopes, severely eroded
-	UHD	Ushar loam, 3 to 10 percent slopes
-	UHD2	Ushar loam, 3 to 10 percent slopes, eroded
-	ULF2	Ushor cobbly loam, 3 to 30 percent slopes, eroded
-	UMF2	Ushar rocky loam, 5 to 30 percent slopes, eroded
-	UND	Ushar-Etta association, 3 to 10 percent slopes
-	UOD2	Ushar-Mill Hollow association, 1 to 10 percent slopes, eroded
-	UOF2	Ushar-Mill Hollow association, 10 to 30 percent slopes, eroded
-	URF	Ushar-Mosida association, 3 to 30 percent slopes
-	USF	Ushar-Murdock association, 3 to 25 percent slopes
-	UTF2	Ushar-Phage association, 3 to 30 percent slopes, eroded
-	UTG2	Ushar-Phage association, 30 to 70 percent slopes, eroded
-	WBG2	Wallsburg very cobbly loam, 30 to 60 percent slopes, eroded
-	WCG2	Wallsburg association, 30 to 60 percent slopes, eroded
-	WMG2	Wallsburg-Maple Mountain association, 3 to 60 percent slopes, eroded
Wt	-	Wet alluvial land
-	YAC	Yardley loam, 1 to 6 percent slopes
-	YME	Yardley-Maple Mountain association, 1 to 25 percent slopes
-	YWF	Yardley-Wallsburg association, 3 to 30 percent slopes

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 1

1 615 000 FEET

160 000 FEET

LIMIT OF SOIL SURVEY

RK

SHF

HKD

PGB

ECD2

RG

SURVEY

SOIL LIMIT

3 2 1

10 11 12

15 14 13

T. 24 S.

R. 9 W. | R. 8 W.

(Joins sheet 2)

(Joins sheet 5)

1 635 000 FEET

150 000 FEET

1 Mile

5000 Feet

Scale 1:20000

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 2

(2)

N

1 660 000 FEET

160 000 FEET

LIMIT OF SOIL SURVEY

RO
PGB
HKD
KLE
PHD
RK
SHF
MOF
AND2
ECD2
FDF
MKF
RC

5 4 2 6 8 9 7 17 16 18

Black Rock Volcano

Lava Ridge

1 Mile
5000 Feet
0 0
Scale 1:20000
¼ 1000
½ 2000
¾ 4000
1 5000

150 000 FEET

1 640 000 FEET

(Joins sheet 1)

(Joins sheet 3)

(Joins sheet 6)

T. 24 S.

R. 8 W. | R. 7 W.

Photoview from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximately positioned on this map.

Land division corners are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1972 as an interagency project by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

BEAVER – COVE FORT AREA, UTAH – SHEET NUMBER 3

3

N

1 Mile

5000 Feet

0 0

Scale 1:20000

1 ¼ ½ ¾ 1

5000 4000 3000 2000 1000 0

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 4

N

1 Mile
5000 Feet

Scale 1:20000

1 710 000 FEET

1 690 000 FEET

R. 7 W. | R. 6 W.

(Joins sheet 3)

(Joins sheet 8)

T. 24 S.

LIMIT OF SOIL SURVEY
Eightmile Point

HRE
MuC2
SRF
RO
MwC
PVF
PUD2

1 6 5 4 3
12 7 8 9 10
13 18 17

W H I T E S A G E
F L A T

BOUNDARY
FOREST
SOIL SURVEY
FISHLAKE NATIONAL
LIMIT OF

Land division corners are approximately positioned on this map.
Photobases from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, south and central zones.
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 5

5

N

1 615 000 FEET

(Joins sheet 1)

145 000 FEET

SURVEY

SOIL

OF

LIMIT

15 14 13 18 17

22 23 24 19 20

27 26 25 30 29

34 35 36 31 32

SHF HKD PGB ECD2 DFD KED MKF KME AND2 KPE

Creek

Cove

T. 24 S.

R. 9 W. | R. 8 W.

(Joins sheet 9)

1 635 000 FEET

(Joins sheet 6)

135 000 FEET

1 Mile 5000 Feet

Scale 1:20000

1 0 1000 2000 3000 4000 5000

¼ ½ ¾

Photobase from 1953, 1960 and 1967 aerial photography. Positions of township and section lines and land division corners are approximately positioned on this map.

(6)

N

1 Mile

5000 Feet

Scale 1:20 000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

(Joins sheet 2)

1 660 000 FEET

1 645 000 FEET

(Joins sheet 5)

1 635 000 FEET

(Joins sheet 10)

1 640 000 FEET

(Joins sheet 7)

T. 24 S.

R. 8 W. | R. 7 W.

ECD2 MKF RO MOF FDF PGB KLE UOF2 KED KME RBG2 MMD RhB MuC2 PtD MYB

17 16 18 19 20 21 29 28 30 31 32 33 36

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a series produced for land-use planning and resource inventory by the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Prepared in cooperation with the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the

BEAVER – COVE FORT AREA, UTAH – SHEET NUMBER 7

1 665 000 FEET

R. 7 W.

(Joins sheet 3)

1 450 000 FEET

T. 24 S.

PGB KLE UOF2 PGB PVF KLE PUD2 HKD MuC2 PUD2 PVF

18 17 16 15 14

19 20 21 22 23

UOF2 PVF PVF

(Joins sheet 6)

30 29 28 27 26

RhB RhB PtD PtD MYB UHD UOF2 RFB PVF PNG2 PNG2

31 32 33 34 35

Canyon Baker

(Joins sheet 8)

(Joins sheet 10)

1 130 000 FEET

1 685 000 FEET

7

N

1 Mile 5000 Feet

Scale 1:20000

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

(8)

N

1 Mile 5000 Feet

Scale 1:20000

0 0

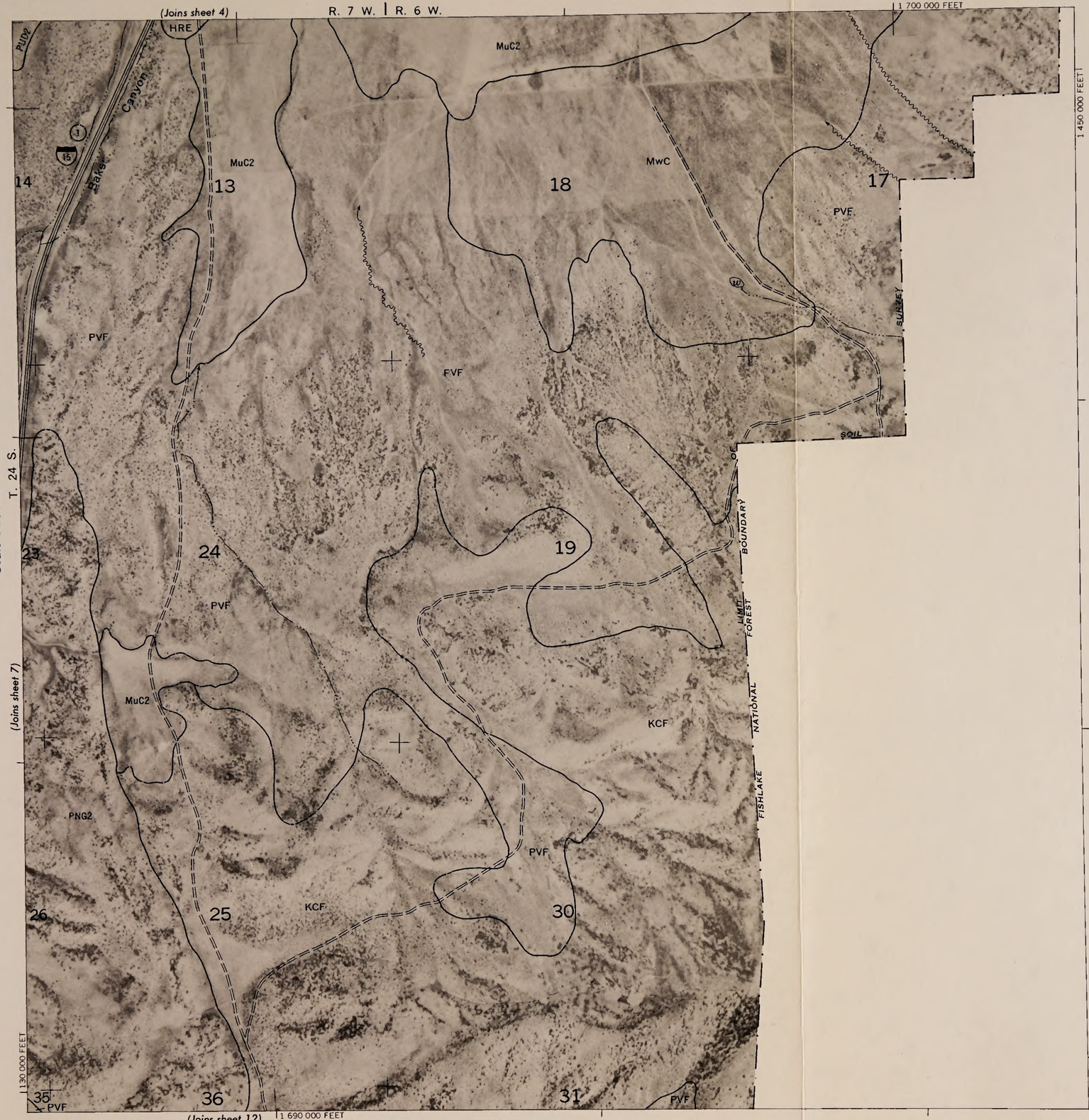
¼ 1000

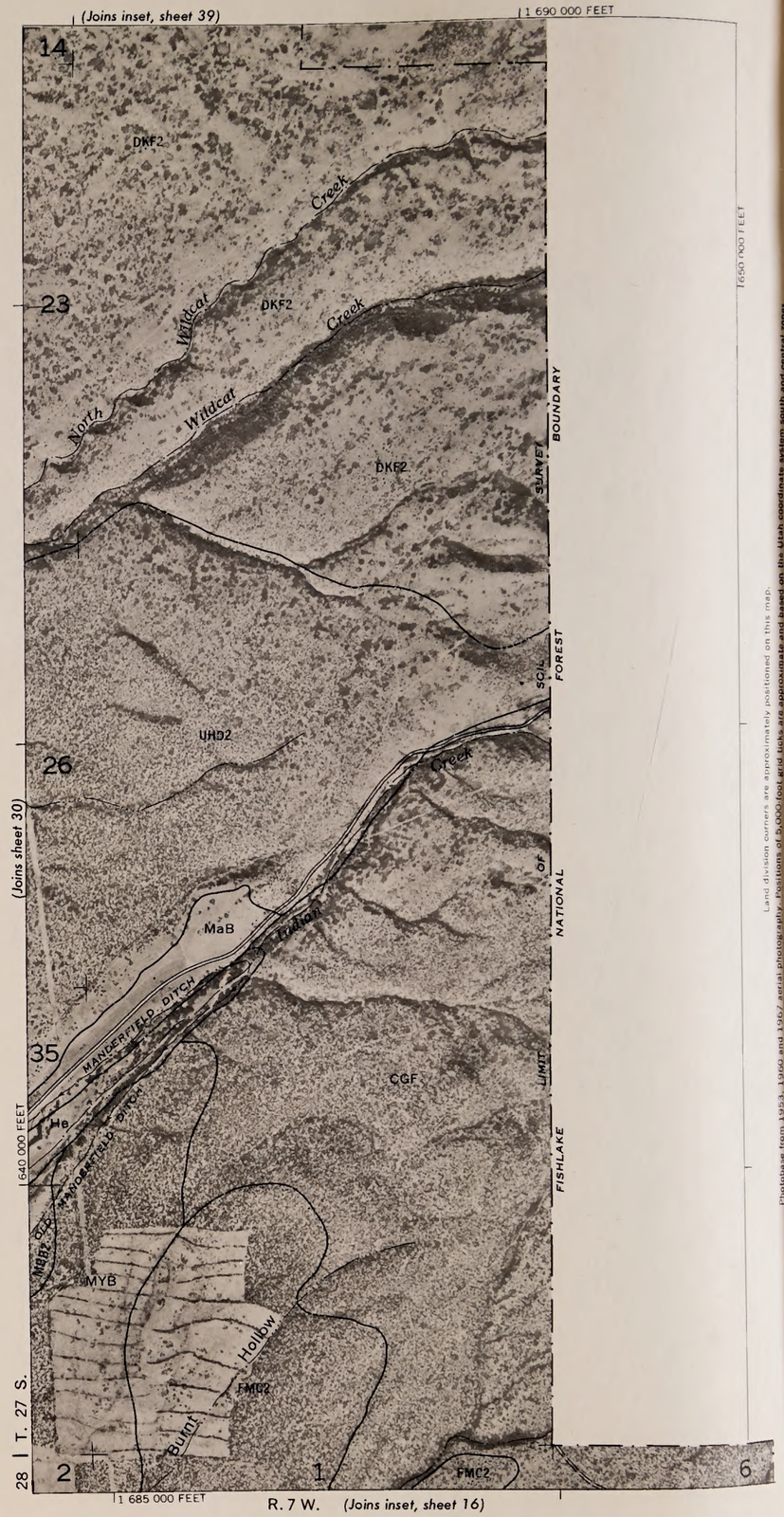
½ 2000

¾ 3000

4000

1 5000





Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, south and central zones. This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

BEAVER – COVE FORT AREA, UTAH – SHEET NUMBER 9

1 615 000 FEET

1130 000 FEET

R. 9 W. | R. 8 W.

(Joins sheet 5)

T. 25 S. | T. 24 S.

34 35 36 31 32

3 2 1 6 5

10 11 12 7 8

15 14 13 18 17

KPE PGB AND2 DeB KED KME ECD2 SKE RO

Cove Creek

BLACK ROCK ROAD

SOIL SURVEY OF LIMIT

(Joins sheet 10)

(Joins sheet 13)

1 635 000 FEET

1115 000 FEET

N

1 Mile 5000 Feet

Scale 1:20000

1 0 0 1000 2000 3000 4000 5000

¼ ½ ¾

9

This map is one of a set compiled in 1979 as part of a soil survey by the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station, and the United States Department of Agriculture, Soil Conservation Service.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

(10)

N

1 Mile
5000 Feet

Scale 1:20000

R. 8 W. | R. 7 W.

1 660 000 FEET

(Joins sheet 6)

32 33 34 35 36 31

5 4 3 2 1 6

8 9 10 11 12 7

17 16 15 14 13 18

KMF FDF MMD RO UOF2 PtD MYB FxC PGB FCD2 KLE HKD PNG2

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 14)

1 640 000 FEET

T. 25 S. | T. 24 S.

130 000 FEET

115 000 FEET

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximately positioned on this map.
Land division corners are approximate and based on the Utah coordinate system, south and central zones.
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 11

11

1 665 000 FEET

R. 7 W.

(Joins sheet 7)

T. 25 S. | T. 24 S.

1 630 000 FEET

(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 15)

1 685 000 FEET

1 115 000 FEET

N

Scale 1:20 000

1 Mile 0 ¼ ½ ¾ 1

5000 Feet 0 1000 2000 3000 4000 5000

MYB PtD UHD FxC RhB UOF2 PVF PNG2 HKD PGB UMF2 UOD2 PCF2 Et

31 32 33 34 35 6 5 4 3 2 7 8 9 10 11 18 17 16 15 14

Antelope Valley

Rest Area

Cove Fort Dog Valley Pass

15

This map is one of a set compiled in 1979 as part of a soil survey by the United States Department of Agriculture.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system, south zone, and are approximately positioned on this map.

Land division corners are approximately positioned on this map.

(12)

N

1 Mile 5000 Feet

Scale 1:20 000

(Joins sheet 8)

R. 7 W. | R. 6 W.

1 695 000 FEET

T. 25 S. | T. 24 S.

DOG VALLEY

SURVEY BOUNDARY

SOIL SURVEY

125 000 FEET

OF FOREST

LIMIT NATIONAL FISHLAKE

PVF Et PNG2 KCF PCF2 UHD MuC2 MwC RNF

35 36 31 1 2 6 11 12 7 13 14 18

115 000 FEET

(Joins sheet 11)

(Joins sheet 16)

1 690 000 FEET

(Joins sheet 16)

1 695 000 FEET (CENTRAL AND SOUTH ZONES)

T. 26 S. | T. 25 S.

90 000 FEET (CENTRAL ZONE)

95 000 FEET (CENTRAL ZONE)

MILLARD COUNTY

BEAVER COUNTY

MT

SURVEY BOUNDARY

SOIL SURVEY OF FOREST LIMIT NATIONAL FISHLAKE

Sulphurdale

Et Ev UHD MeC MNF PLF2 FGC2 SLD2 MaB MaC FEC2 UlF2

31 36 35 6 1 2 11 12 13 14

695 000 FEET (SOUTH ZONE)

690 000 FEET (SOUTH ZONE)

(Joins sheet 19)

(Joins inset, sheet 44)

1 690 000 FEET (CENTRAL AND SOUTH ZONES)

R. 7 W. | R. 6 W.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 13

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Interior Bureau of Land Management and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 14

(14)

N

1 Mile — 5000 Feet

Scale 1:20 000

0 — 0

1000 — 2000 — 3000 — 4000 — 5000

¼ — ½ — ¾ — 1

(Joins sheet 10)

1 660 000 FEET

17 16 15 14 13 18

20 21 22 23 24 19

29 28 27 26 25 30

32 33 34 35 36 31

ECD2 — PGB — FDF — KLE — HKD — PNG2 — KME — HIF — HHD — KPE

BLACK ROCK ROAD

Cove Creek

Creek

Cove

100 000 FEET

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 18)

1 640 000 FEET

T. 25 S.

R. 8 W. | R. 7 W.

1 665 000 FEET

(Joins sheet 11)

N

Scale 1:20 000

1 Mile | 0 | ¼ | ½ | ¾ | 1

5000 Feet | 0 | 1000 | 2000 | 3000 | 4000 | 5000

(Joins sheet 16)

FEC2

100 000 FEET

110 000 FEET

T. 25 S.

(Joins sheet 14)

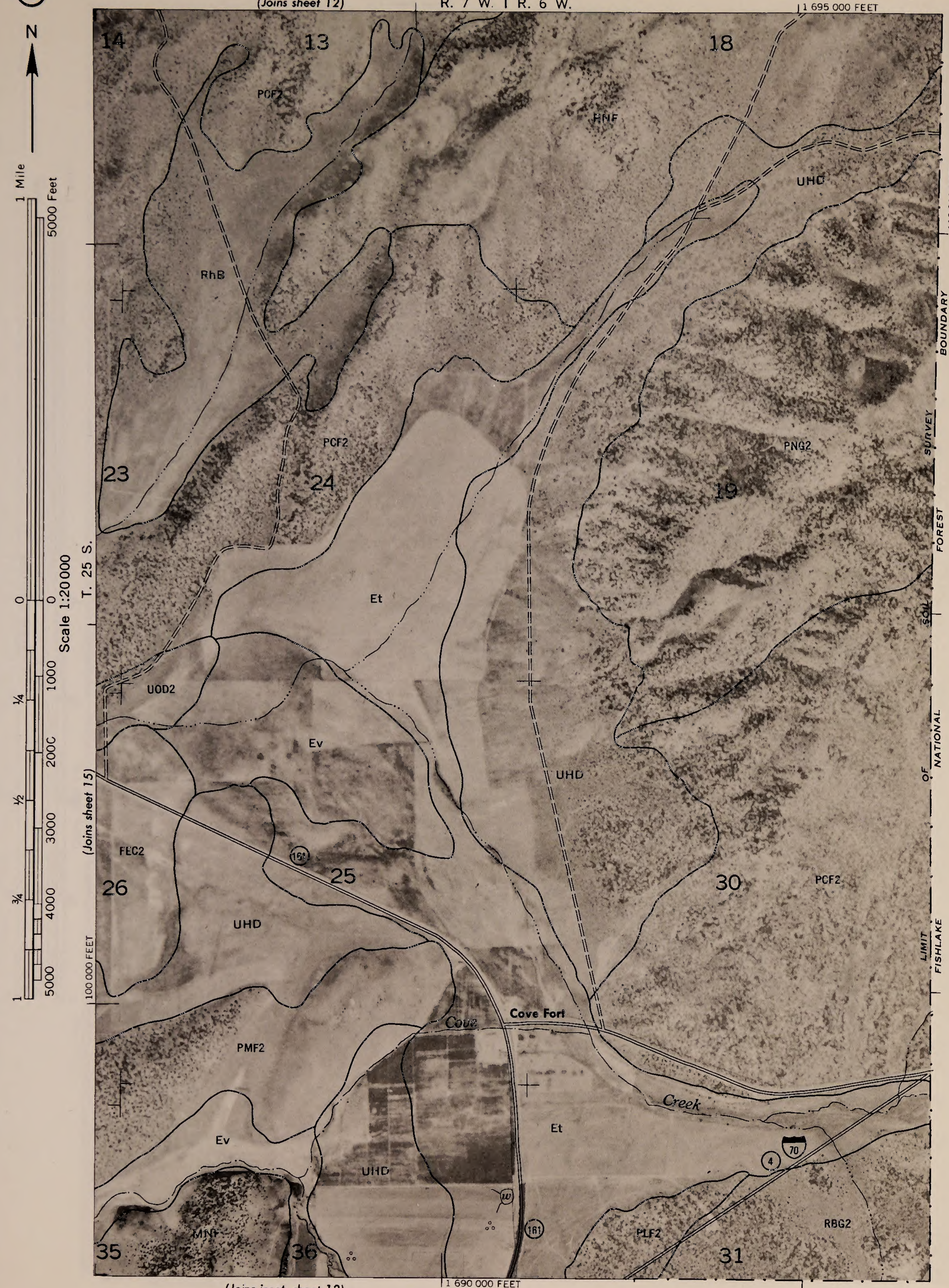
R. 7 W.

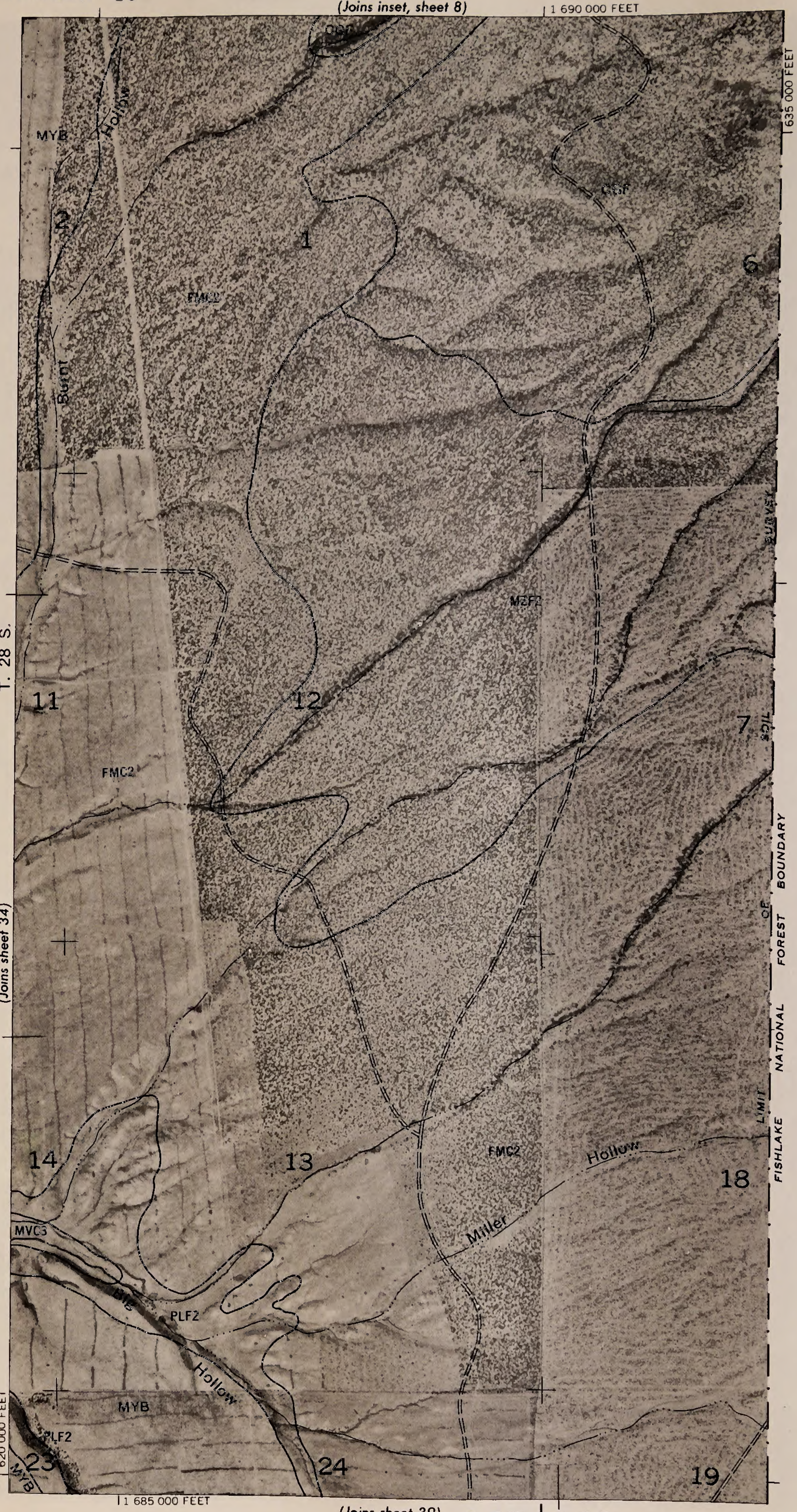
(Joins sheet 19)

1 685 000 FEET

This map is one of a set compiled in
Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 16





Land division corners are approximately positioned on this map.
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

4000 AND 5000-FOOT GRID TICKS IN CENTRAL ZONE

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 17

1 615 000 FEET (CENTRAL AND SOUTH ZONES)

(Joins sheet 13)

T. 26 S. | T. 25 S.

95 000 FEET (CENTRAL ZONE)

695 000 FEET (SOUTH ZONE)

691 000 FEET (CENTRAL ZONE)

690 000 FEET (SOUTH ZONE)

1 635 000 FEET (CENTRAL AND SOUTH ZONES)

R. 9 W. | R. 8 W.

(Joins sheet 20)

(Joins sheet 18)

MILLARD COUNTY

BEAVER COUNTY

SOIL SURVEY OF BEAVER COUNTY, UTAH, CENTRAL PART — LIMIT

SKE SEF SLD MRG2 FGB HHD BEF

33 34 35 36 31 32

4 3 2 1 6 5

9 10 11 12 7 8

16 15 14 13 18 17

17

N

1 Mile

5000 Feet

Scale 1:20 000

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 18

(Joins sheet 14)

1 660 000 FEET (CENTRAL AND SOUTH ZONES)

N

1 Mile — 5000 Feet

Scale 1:20000

0 — 0

¼ — 1000

½ — 2000

¾ — 4000

1 — 5000

690 000 FEET (SOUTH ZONE)

690 000 FEET (CENTRAL ZONE)

32 33 34 35 36 31

5 4 3 2 1 6

8 9 10 11 12 7

17 16 15 14 13 18

HHD PGB KPE SLD MRG2 MuC2 SLD2 BNE2 URF

MILLARD COUNTY
BEAVER COUNTY

Horse Flat

(Joins sheet 17)

(Joins sheet 21)

1 640 000 FEET (CENTRAL AND SOUTH ZONES)

(Joins sheet 19)

695 000 FEET (CENTRAL ZONE)

T. 26 S. T. 25 S.

R. 8 W. R. 7 W.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximately positioned on this map.

Land division corners are approximate and based on the Utah coordinate system south and central zones.

Bureau of Land Management and the Utah Agricultural Statistical Service.

Interior, Bureau of Land Management and the Utah Agricultural Statistical Service.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 19

19

1 665 000 FEET (CENTRAL AND SOUTH ZONES)

(Joins sheet 15)

T. 26 S. | T. 25 S.

95 000 FEET (CENTRAL ZONE)

31 32 33 34 35

PGB

MNF

MNF

6 5 4 3 2

KPE

MILLARD COUNTY
BEAVER COUNTY

Et

Cinder Crater

RQ

7 8 9 10 11

KPE

MNF

PQF2

Ev

MaB

(Joins sheet 18)

URF

PQF2

MaC

Ev

18 17 16 15 14

R. 7 W.

(Joins sheet 22)

1 685 000 FEET (CENTRAL AND SOUTH ZONES)

695 000 FEET (SOUTH ZONE)

690 000 FEET (SOUTH ZONE)

(Joins inset, sheet 12)

N

1 Mile

5000 Feet

Scale 1:20000

1/4 1/2 3/4 1

0 1000 2000 3000 4000 5000

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 20

20

N

1 Mile

5000 Feet

Scale 1:20000

0 0 1000 2000 3000 4000 5000

¼ ½ ¾ 1

Land division corners are approximately positioned on this map.

Planimetric base from 1953, 1960 and 1967 aerial photography. Projection and 5,000-foot grid ticks are based on the Utah coordinate system, south and central zones.

Soil Survey by the Soil Conservation Service, United States Department of Agriculture

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 21

21

N

1 Mile

5000 Feet

0 0

1/4 1000

1/2 2000

3/4 3000

1 4000

5000

Scale 1:20 000

This map is one of a set compiled in 1975 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 22

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximately positioned on this map.
Land division corners are approximately positioned on this map.

1 585 000 FEET

670 000 FEET

LIMIT OF SOIL SURVEY

SOIL SURVEY

ESD2

BLE

HHD

SLD

MPG

BSD

6 5 4

7 8 9

18 17 16

T. 27 S.

(Joins sheet 24)

(Joins sheet 27)

R. 9 W.

1 605 000 FEET

655 000 FEET

23

N

1 Mile

5000 Feet

Scale 1:20000

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 24

(Joins sheet 20)

1 630 000 FEET

670 000 FEET

T. 27 S. | T. 26 S.

N

1 Mile — 5000 Feet

Scale 1:20 000

0 — 0

¼ — 1000

½ — 2000

¾ — 3000

1 — 4000 — 5000

SURVEY

SLR

MPG

SLD

BEF

CSF2

BLE

Negro Wash

Mag

MHG

FSD2

BCF2

Little Cedar Cove

Big Cedar Cove

Bailey Mountain

Bailey Ridge

PCF2

WMG2

Bearskin Mountain

34 35 36 31 32

4 3 2 1 6 5

9 10 11 12 7 8

16 15 14 13 18 17

(Joins sheet 23)

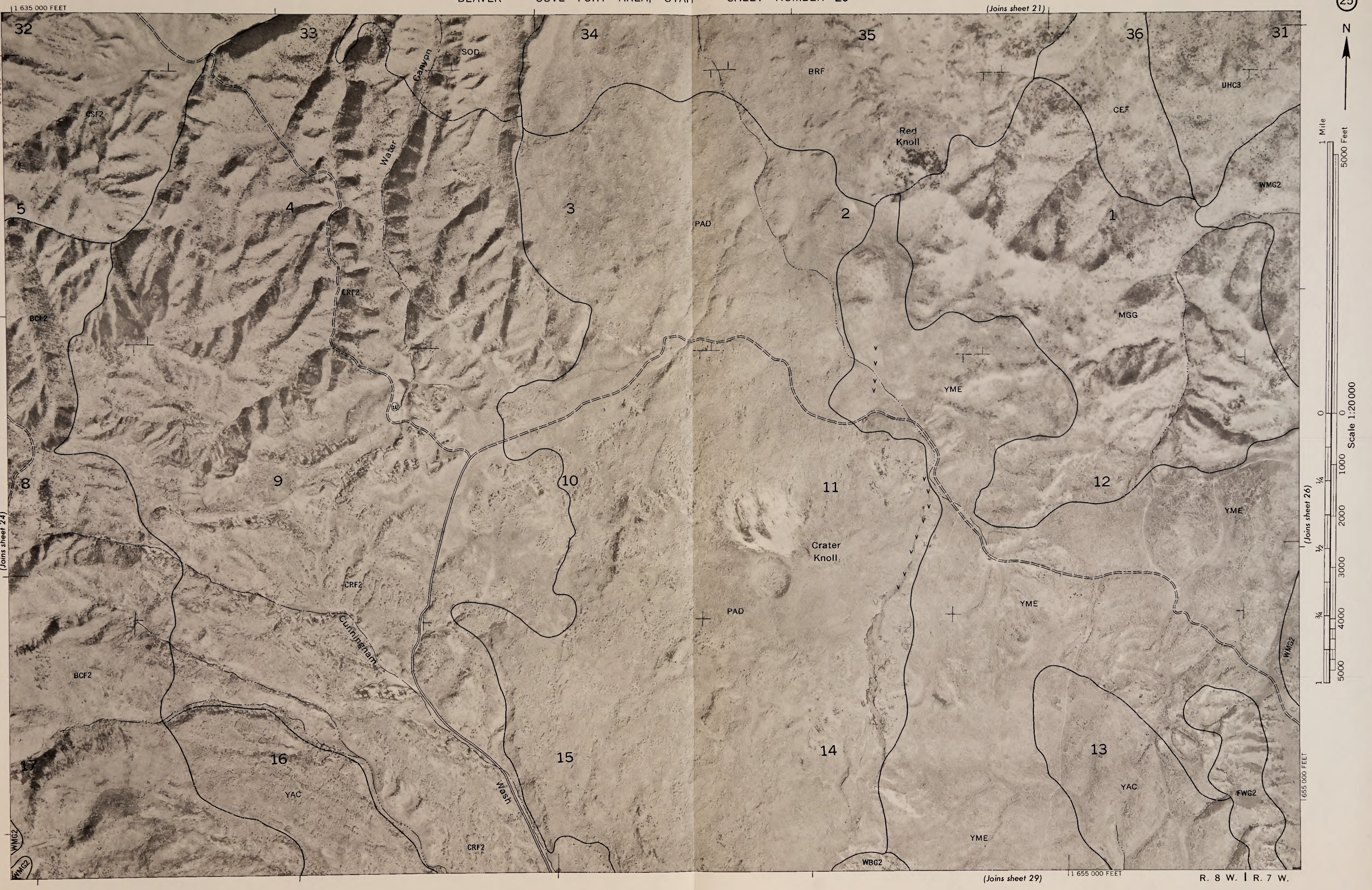
(Joins sheet 25)

655 000 FEET

1 610 000 FEET

(Joins sheet 28)

R. 9 W. | R. 8 W.



Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
Land division corners are approximately positioned on this map.

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 27

1 585 000 FEET

655 000 FEET

27

N

1 Mile

5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

This map is one of a set compiled in 1970 as part of a soil survey by the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
Land division corners are approximately positioned on this map.

Soil survey compiled in 1970 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

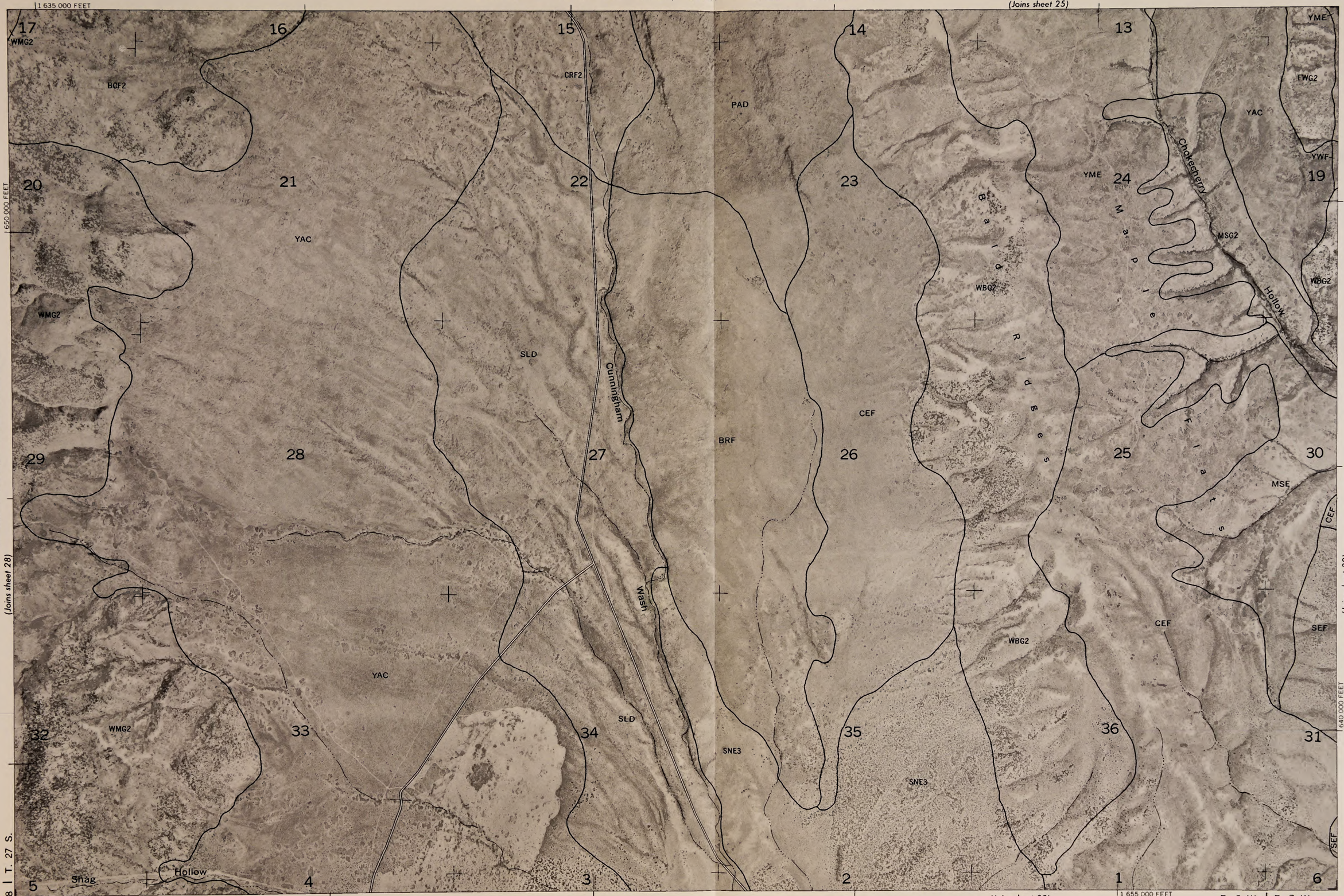
(28)

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 28

Photobase from 1953, 1960 and 1967 aerial photography. Position of 6,000-foot grid ticks are approximately positioned on this map.

Land division corners are approximately positioned on the Utah coordinate system south and central zones.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 29



29

N

1 Mile

5000 Feet

Scale 1:20000

0 ¼ ½ ¾ 1

1000 2000 3000 4000 5000

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 30

(30)

N

1 Mile — 5000 Feet

0 — 0

Scale 1:20 000

¼ — 1000 — 2000

½ — 3000

¾ — 4000

1 — 5000

(Joins sheet 26)

1 680 000 FEET

640 000 FEET

(Joins sheet 29)

1 660 000 FEET

(Joins sheet 34)

(Joins inset, sheet 8)

28 | T. 27 S.

R. 7 W.

Fortuna Canyon

Chokecherry Canyon

Cedar Knoll

Hollow

Spring

Mud

North Wildcat Creek

Wildcat Creek

Fields

Indian Creek

MANDERFIELD DITCH

Et

19 20 21 22 23

30 29 28 27 26

31 32 33 34 35

6 5 4 3 2

YME YWF FVF2 FWG2 RMF MSE CEF CGF DKF2 UHD2 WBG2 MSG2 SEF MVC3 FEC2 MuB PLG2 UHD UTF2 MYB MaB MBB2 He

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5 000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 31

31

1 585 000 FEET

635 000 FEET

(Joins sheet 27)

HKD

HHD

SEF

SLD

6

5

4

BNE2

MRG2

Coral

Canyon

SURVEY

SOIL

OF

LIMIT

HHD

7

8

9

SEF

SDF

SLD2

Ro

T. 28 S.

(Joins sheet 32)

HHD

18

17

16

Cow

Hollow

SLD2

SDF

BKE

19

20

21

SEF

SLD2

1 625 000 FEET

R. 9 W.

(Joins sheet 35)

1 605 000 FEET

N

1 Mile

5000 Feet

Scale 1:20000

1 ¼ ½ ¾ 1

5000 4000 3000 2000 1000 0 0

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 32

(32)

N

1 Mile — 5000 Feet

Scale 1:20000

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

5000

(Joins sheet 28)

1 630 000 FEET

1 635 000 FEET

SEF

SLD

MRG2

Wycroft

Canyon

BNE2

South Twin Flat Mountain

WMG2

Right Fk Ranch Can

RO

COF2

Burnt Hollow

Sunnyside

Hollow

MHG

WMG2

4 3 2 1 6 5

9 10 11 12 7 8

(Joins sheet 31)

Corral Canyon

SLD2

SDF

OSF2

Rock Corral

Oow

SEF Hollow

Granite Peak

Milford Needle

Porcupine Canyon

MXF

Beaumont Canyon

Solomans Hol

16 15 14 13 18 17

21 22 23 24 19 20

MINERAL MOUNTAINS

T. 28 S.

(Joins sheet 33)

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Utah Agricultural Experiment Station.

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

1 610 000 FEET

(Joins sheet 36)

R. 9 W. | R. 8 W.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 33

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
Land division corners are approximately positioned on this map.

1 635 000 FEET

635 000 FEET

(Joins sheet 29)

R. 8 W. | R. 7 W.

33

N

1 Mile

5000 Feet

Scale 1:20000

(Joins sheet 34)

625 000 FEET

(Joins sheet 32)

T. 28 S.

(Joins sheet 37)

1 655 000 FEET

SLD
YAC
CEF
WMG2
SLD2
UHD2
Burnt
Sunnyside Hollow
Hollow
Wash
SFF
SNE3
SEF
RO
UAD2
MVC3
Cunningham
MHG
SFF
SNE3
Black
Mountain
MVC3.
SEF
FZC2
PLF2
MVC3
Burnt
Hollow
SFF
MVC3
CN
FZC2
RO
FZC2
USF
BLE
MVC3

5 4 3 2 1 6
8 9 10 11 12 7
17 16 15 14 13 18
20 21 22 23 24 19

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 34

(Joins sheet 30)

(Joins sheet 33)

(Joins sheet 38)

R. 7 W.

T. 28 S.

(Joins inset, sheet 16)

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

... Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 35

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station in cooperation with the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Geological Survey.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 36

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 37

37

N

R. 8 W. | R. 7 W.

1 635 000 FEET

620 000 FEET

(Joins sheet 33)

(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 42)

1 665 000 FEET

605 000 FEET

T. 29 S. | T. 28 S.

1 Mile

5000 Feet

Scale 1:20 000

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

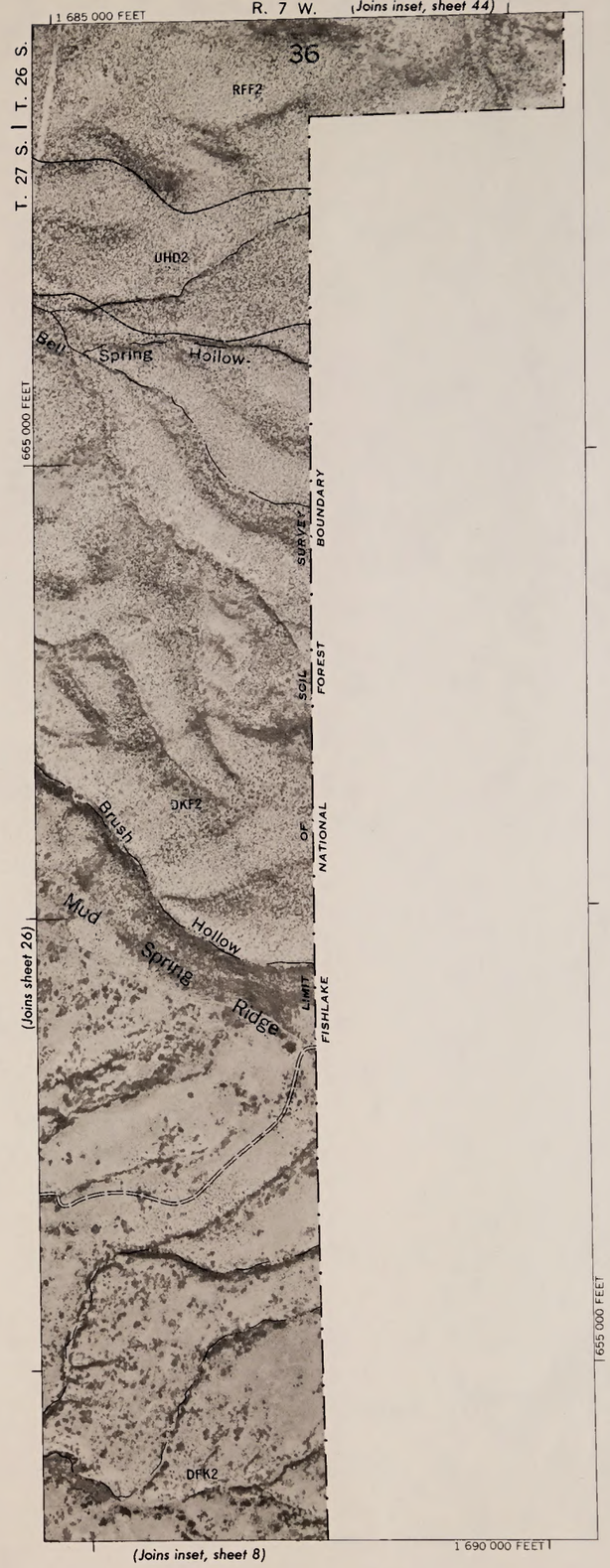
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 39



Land division corners are approximate and based on the Utah coordinate system south and central zones.
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximately positioned on this map.
Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
This map is one of a set compiled [illegible] Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

(40)

N

1 Mile — 5000 Feet

0 — 0

Scale 1:20000

¼ — 1000 — 2000

½ — 3000

¾ — 4000

1 — 5000

(Joins sheet 35)

1 605 000 FEET

590 000 FEET

600 000 FEET

1 585 000 FEET

(Joins sheet 45)

(Joins sheet 41)

T. 29 S.

R. 9 W.

6 5 4

7 8 9

18 17 16

19 20 21

RO

HECLA MINE

WMG2

PNG2

CSF2

Canyon

Cave

Bradshaw Mountain

SURVEY

OF

LIMIT

PNG2

Canyon

Gulch

MXF

HKD

PPF2

PNGZ

Lincoln

PGF2

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1969 as part of a soil survey by the United States Department of the

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
This map is one of a set completed in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
Land division corners are approximately positioned on this map.

1 610 000 FEET

500 000 FEET

(Joins sheet 36)

(Joins sheet 40)

(Joins sheet 42)

(Joins sheet 46)

T. 29 S.

R. 9 W. | R. 8 W.

1 630 000 FEET

590 000 FEET

MOUNTAINS

MINERAL

Cherry Creek

Bartons Hollow

BLUE STAR MINE

RO

WMG2

CSF2

MXF

RDG2

BNE2

BSD

HIF

PNG2

PID2

PGF2

FGC2

UHD

SEF

PxB

FxC

DeB

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

N

1 Mile

5000 Feet

Scale 1:20000

0 1000 2000 3000 4000 5000

¼ ½ ¾ 1

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 42

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 43

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
Land division corners are approximately positioned on this map.

1 660 000 FEET

600 000 FEET

(Joins sheet 38)

(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 48)

1 590 000 FEET

1 680 000 FEET

T. 29 S.

R. 7 W.

43

N

1 Mile

5000 Feet

Scale 1:20000

SOILS NOT SURVEYED

BEAVER
(county seat)

Carter

Creek

Dry Creek

North Creek

Beaver River

CARTER DITCH

NORTH DITCH

MAMMOTH CANAL

HARRIS DITCH

CITY DITCH

WILLIS DITCH

COUNTY RD. DRAIN

LIMIT OF SURVEY

MAMMOTH CANAL DITCH

CITY CANAL

water

N

1 Mile
5000 Feet
Scale 1:20 000
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

4000 AND 5000-FOOT GRID TICKS

1 685 000 FEET

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

1 585 000 FEET

585 000 FEET

(Joins sheet 40)

45

N

1 Mile

5000 Feet

Scale 1:20 000

(Joins sheet 46)

575 000 FEET

T. 30 S. | T. 29 S.

R. 9 W.

(Joins sheet 50)

1 605 000 FEET

SURVEY

OF

SOIL

LIMIT

Lincoln Gulch

Yellow Mountain

MOUNTAINS

MINERAL

19 20 21 28 29 30 31 32 33 4 5 6

HKD PPF2 PNG2 PWF2 MXF PCF2 RO

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 46

(46)

N

1 Mile

5000 Feet

Scale 1:20000

(Joins sheet 41)

1 630 000 FEET

1 585 000 FEET

575 000 FEET

1 610 000 FEET

(Joins sheet 45)

(Joins sheet 47)

(Joins sheet 51)

SUMMIT MOUNTAINS

Indian Creek

Beaver River

Adamsville

MINERSVILLE RESERVOIR

G. P.

21 22 23 24 19 20

28 27 26 25 30 29

33 34 35 36 31 32

4 3 2 1 6 5

PCF2 PFG PSC2 PID2 FGC2 HPE HIF HKD DeB DeC DaC FxB FxC PxB PyB DHF DCF Ds

R. 9 W. | R. 8 W.

T. 30 S. | T. 29 S.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 47

47

N

1 Mile

5000 Feet

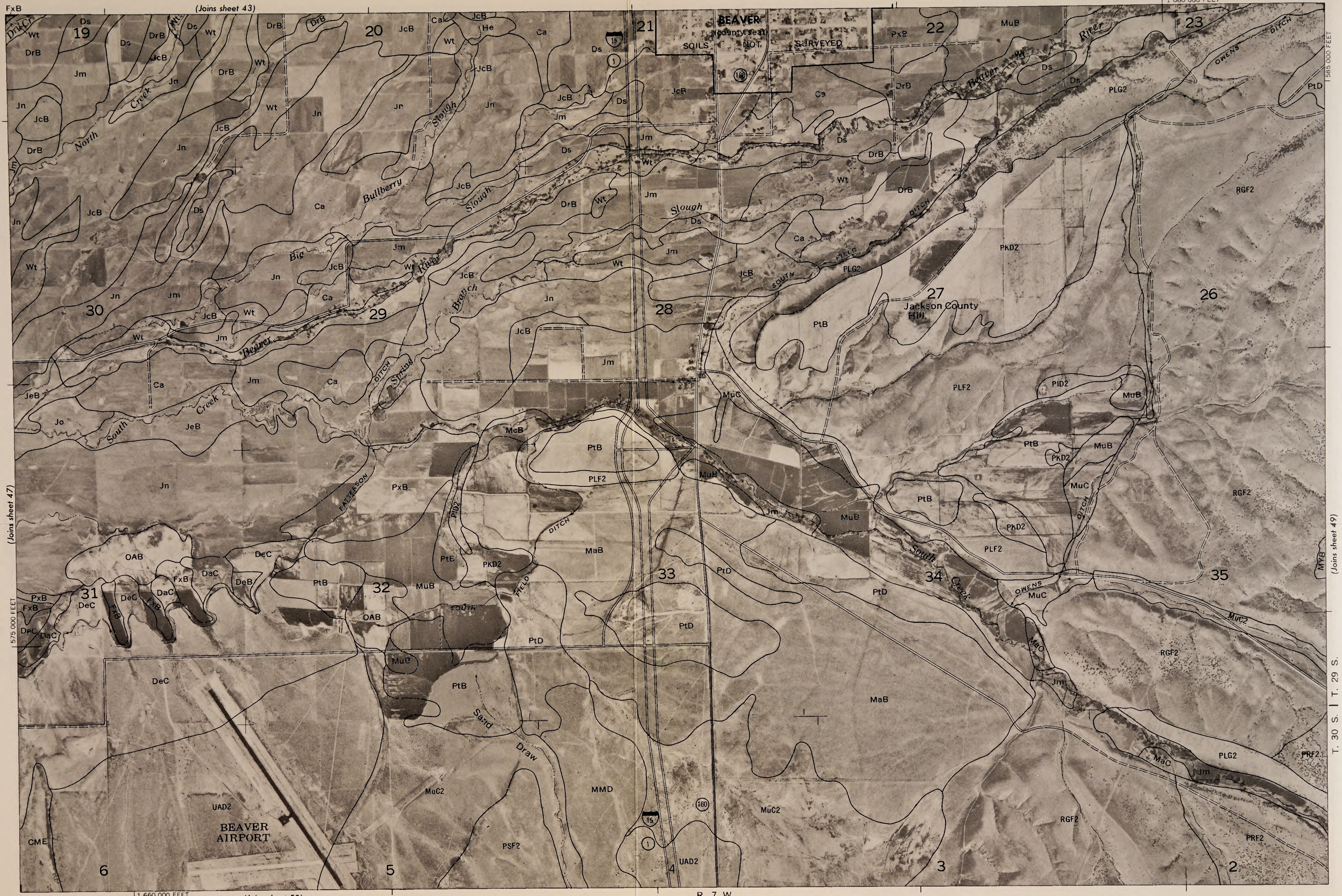
Scale 1:20000

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

(Joins sheet 43)



N

1 Mile
5000 Feet

0 ¼ ½ ¾ 1 Mile
0 1000 2000 3000 4000 5000 Feet

Scale 1:20 000

(Joins sheet 47)

(Joins sheet 53)

R. 7 W.

(Joins sheet 49)

T. 30 S. | T. 29 S.

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 49

49

N

1 685 000 FEET

(Joins sheet 44)

585 000 FEET

T. 30 S. | T. 29 S.

(Joins sheet 48)

R. 7 W. | R. 6 W.

(Joins sheet 54)

1 705 000 FEET

570 000 FEET

Black Mountain

Grassy Canyon

South Canyon

SOIL SURVEY OF LIMIT

FISHLAKE NATIONAL FOREST BOUNDARY

PLG2 RGF2 PtD RO PMF2 RGF2 PRF2 MuC2 RGF2 MuC2 PRF2 PtB PRF2 PLG2 PRF2 UtF2 MYB REG2 PdB

23 24 19 26 25 30 35 36 31 32 2 1 6 5

1 Mile 5000 Feet

Scale 1:20000

0 0

¼ 1000

½ 2000

¾ 3000

1 4000 5000

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 50

(Joins sheet 45)

N

1 Mile

5000 Feet

Scale 1:20 000

0 ¼ ½ ¾ 1

5000 4000 3000 2000 1000 0 5000

(Joins sheet 55)

R. 9 W.

(Joins sheet 51)

T. 30 S.

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 51

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 52

(52)

(Joins sheet 47)

1 655 000 FEET

570 000 FEET

555 000 FEET

1 635 000 FEET

(Joins sheet 51)

(Joins sheet 53)

(Joins sheet 57)

T. 30 S.

R. 8 W. | R. 7 W.

N

1 Mile

5000 Feet

Scale 1:20 000

0 0

¼ 1000

½ 2000

¾ 3000

1 4000

5000

DHF HPE DHF HKD DeB FxC UAD2 MVC3 CME HKD HPE PSF2 Camel Hollow UTF2 ULF2 CME PCF2

5 4 3 2 1 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5 000-foot grid ticks are approximately positioned on this map.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 53

Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.
Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
Land division corners are approximately positioned on this map.

1 660 000 FEET

570 000 FEET

(Joins sheet 48)

BEAVER AIRPORT

MMD

Sand Draw

MuC2

UAD2

MeC

RGF2

PRF2

PSF2

CME

MLF

PCF2

RBG2

REG2

15

160

1

91

6 5 4 3 2 1

7 8 9 10 11 12

18 17 16 15 14 13

19 20 21 22 23 24

T. 30 S.

R. 7 W.

(Joins sheet 52)

(Joins sheet 54)

(Joins sheet 58)

1 555 000 FEET

1 680 000 FEET

53

N

1 Mile

5000 Feet

Scale 1:20 000

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

54

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 54

(Joins sheet 49)

1 705 000 FEET

N

1 Mile — 5000 Feet

Scale 1:20000

T. 30 S.

South Creek

Birch Creek

Twist Big Creek

SURVEY BOUNDARY

SOIL FOREST

NATIONAL LIMIT OF FISHLAKE

565 000 FEET

555 000 FEET

1 685 000 FEET

(Joins sheet 53)

R. 7 W. | R. 6 W.

(Joins sheet 59)

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000 foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 55

55

1 585 000 FEET

555 000 FEET

(Joins sheet 50)

19 20 21

30 29 28

31 32 33

HPE

MPG

FUF

RK

PPF2

PLG2

ULF2

Black Mountain

Uncle Benneys Orchard

Big Wash

SOIL SURVEY OF IRON COUNTY LIMIT

T. 30 S.

R. 9 W.

1 605 000 FEET

540 000 FEET

(Joins sheet 56)

N

Scale 1:20 000

1 Mile

5000 Feet

0 1/4 1/2 3/4 1

0 1000 2000 3000 4000 5000

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 56

N

Scale 1:20 000

0 ¼ ½ ¾ 1 Mile

0 1000 2000 3000 4000 5000 Feet

(Joins sheet 57)

T. 30 S.

Land division corners are approximately positioned on this map.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 57

57

(Joins sheet 52)

1 635 000 FEET

550 000 FEET

T. 30 S.

(Joins sheet 56)

20 21 22 23 24

29 28 27 26 25

32 33 34 35 36

PSF2 UTF2 ULF2 CME REG2 PCF2

LIMIT OF IRON SOIL SURVEY COUNTY

(Joins sheet 58)

540 000 FEET

R. 8 W.

1 655 000 FEET

N

1 Mile 5000 Feet

Scale 1:20 000

0 1000 2000 3000 4000 5000

1/4 1/2 3/4 1

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.

Land division corners are approximately positioned on this map.

BEAVER — COVE FORT AREA, UTAH — NO. 56

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 58

Land division corners are approximately positioned on this map.
Photobase from 1953, 1960 and 1967 aerial photography at various scales.
Polyconic projection. 1927 North American datum.
10,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones.
This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station, and the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Geological Survey, in cooperation with the Utah Agricultural Experiment Station.

BEAVER — COVE FORT AREA, UTAH — NO. 58

BEAVER — COVE FORT AREA, UTAH — SHEET NUMBER 59

59

N

1 Mile
5000 Feet
Scale 1:20 000

0 0
1000 ¼ 2000
½ 3000
¾ 4000
1 5000

REAVER - COVE FORT AREA, UTAH NO. 58

This map is one of a set compiled in 1973 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station.

Photobase from 1953, 1960 and 1967 aerial photography. Positions of 5,000-foot grid ticks are approximate and based on the Utah coordinate system south and central zones. Land division corners are approximately positioned on this map.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

BEAVER-COVE FORT AREA, UTAH, PARTS OF BEAVER AND MILLARD COUNTIES

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
UTAH AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

The first letter, always a capital, is the initial one of the soil name. The second letter is a capital if the mapping unit is one of the low intensity survey; otherwise it is a small letter. The third letter, B, C, D, E, F, or G, shows the slope. Most symbols without a slope letter are for nearly level soils, but some are for land types that have a considerable range in slope. A final number, 2 or 3, in a symbol shows that the soil is eroded or severely eroded.

SYMBOL		NAME
High Intensity	Low Intensity	
-	ALD3	Alovar loam, 3 to 10 percent slopes, severely eroded
-	AND2	Antelope Springs-Kessler association, 1 to 10 percent slopes, eroded
-	AS	Antelope Springs silt loam, low lime subsoil variant
-	BCF2	Bearskin-Cowers very rocky association, 2 to 30 percent slopes, eroded
-	BEF	Bearskin-Cowers extremely rocky association, 2 to 30 percent slopes
-	BKE	Blackett coarse sandy loam, 3 to 20 percent slopes
-	BLE	Blackett-Blue Star association, 3 to 20 percent slopes
-	BNE2	Blackett-Snake Hollow association, 3 to 20 percent slopes, eroded
-	BRF	Black Ridge extremely rocky silt loam, 6 to 30 percent slopes
-	BSD	Blue Star cobbly sandy loam, 3 to 10 percent slopes
Ca	-	Chipman silty clay loam
-	CEF	Clegg loam, 6 to 30 percent slopes
-	CGF	Clegg cobbly loam, 6 to 30 percent slopes
-	CLF	Clegg very rocky loam, 6 to 30 percent slopes
-	CME	Cokel coarse sandy loam, 3 to 15 percent slopes
-	CN	Colluvial land and Shale outcrop
-	COF2	Cowers coarse sandy loam, 2 to 30 percent slopes, eroded
-	CRF2	Cowers association, 2 to 30 percent slopes, eroded
-	CSF2	Cowers-Bearskin association, 2 to 30 percent slopes, eroded
DaC	-	Decca gravelly sandy loam, 3 to 6 percent slopes
-	DCF	Decca cobbly sandy loam, 10 to 30 percent slopes
DeB	-	Decca loam, 1 to 3 percent slopes
DeC	-	Decca loam, 3 to 6 percent slopes
-	DFD	Decca very rocky loam, 2 to 10 percent slopes
-	DHF	Decca-Hiko Peak complex, 1 to 30 percent slopes
-	DKF2	Deer Creek cobbly loam, 3 to 30 percent slopes, eroded
-	DLE2	Deer Creek very cobbly loam, 3 to 20 percent slopes, eroded
DrB	-	Draper loam, 1 to 3 percent slopes
Ds	-	Draper loam, sandy subsoil variant
-	ECD2	Escalante sandy loam, 2 to 10 percent slopes, eroded
-	ESD2	Escalante-Hiko Peak complex, 2 to 10 percent slopes, eroded
Et	-	Etta loam
Ev	-	Etta clay, heavy variant
-	FDF	Firmage-Oakden association, 5 to 30 percent slopes
-	FEC2	Flowell loam, 3 to 6 percent slopes, eroded
-	FGC2	Flowell gravelly loam, 3 to 6 percent slopes, eroded
FlB	-	Flowell association, 1 to 3 percent slopes
-	FMC2	Flowell association, 3 to 6 percent slopes, eroded
-	FUF	Flowell-Ushor association, 3 to 30 percent slopes
-	FVF2	Flowell loam, cold variant, 10 to 30 percent slopes, eroded
-	FWG2	Flowell cobbly loam, cold variant, 30 to 60 percent slopes, eroded
FxB	-	Fruitland loam, 1 to 3 percent slopes
FxC	-	Fruitland loam, 3 to 6 percent slopes
-	FZC2	Fruitland loam, 1 to 6 percent slopes, eroded
-	HAB	Hansel loam, 1 to 3 percent slopes
He	-	Honsel silt loam, low lime variant
-	HHD	Haybourne coarse sandy loam, 1 to 10 percent slopes
-	HIF	Hiko Peak coarse sandy loam, 3 to 30 percent slopes
-	HKD	Hiko Peak cobbly loam, 2 to 10 percent slopes
-	HPE	Hiko Peak-Decca association, 1 to 15 percent slopes
-	HRE	Hiko Peak-Fruitland association, 1 to 15 percent slopes
JcB	-	James Canyon silt loam, 1 to 3 percent slopes
JeB	-	James Canyon silt loam, strongly saline, 1 to 3 percent slopes
Jm	-	James Canyon loam, calcareous variant
Jn	-	James Canyon silty clay loam, heavy variant
Jo	-	James Conyon silty clay loam, heavy variant, saline
-	KCF	Kersick very rocky loam, 5 to 30 percent slopes
-	KED	Kessler loam, 1 to 10 percent slopes
-	KLE	Kessler cobbly loam, 3 to 20 percent slopes
-	KME	Kessler-Hiko Peak association, 1 to 20 percent slopes
-	KPE	Kessler-Penoyer association, 1 to 20 percent slopes
MoB	-	Manderfield loam, 1 to 3 percent slopes
MaC	-	Manderfield loam, 3 to 6 percent slopes
-	MBB2	Manderfield loam, 1 to 3 percent slopes, eroded
McB	-	Manderfield loam, moderately deep over gravel, 1 to 3 percent slopes
MdB	-	Manderfield gravelly loam, 1 to 3 percent slopes
MeC	-	Manderfield cobbly loam, 1 to 6 percent slopes
-	MFC2	Manderfield cobbly loam, 1 to 6 percent slopes, eroded
-	MGG	Maple Mountain cobbly loam, 25 to 50 percent slopes
-	MHG	May Day association, 10 to 60 percent slopes
-	MIE	May Day-Deer Creek association, 3 to 20 percent slopes
-	MKF	McQuarrie rocky loam, 2 to 30 percent slopes
-	MLF	McQuarrie very cobbly loam, coarse textured subsoil variant, 5 to 30 percent slopes
-	MMD	Mill Hollow very cobbly loam, 2 to 10 percent slopes
-	MNF	Mill Hollow-Pharo association, 2 to 30 percent slopes
-	MOF	Mill Hollow-Ushor association, 3 to 30 percent slopes
-	MPG	Mineral Mountain extremely rocky loam, 30 to 60 percent slopes
-	MRG2	Mineral Mountain-Snake Hollow association, 3 to 60 percent slopes, eroded
-	MSE	Mineral Mountain very cobbly loam, gravelly subsoil variant, 2 to 20 percent slopes
-	MSG2	Mineral Mountain very cobbly loam, gravelly subsoil variant, 40 to 60 percent slopes, eroded
-	MT	Mine wash
MuB	-	Mosida loam, 1 to 3 percent slopes
MuC	-	Mosida loam, 3 to 6 percent slopes
MuC2	-	Mosida loam, 1 to 6 percent slopes, eroded
-	MVC3	Mosida loam, 1 to 6 percent slopes, severely eroded
MwC	-	Mosida loam, gravelly substratum, 1 to 6 percent slopes
-	MXF	Mud Springs extremely rocky coarse sandy loam, 30 to 40 percent slopes
-	MYB	Murdock silt loam, 1 to 3 percent slopes
-	MZF2	Murdock-Flowell association, 1 to 30 percent slopes, eroded
-	OAB	Oasis loam, 1 to 3 percent slopes
-	PAD	Paice cobbly loam, 3 to 10 percent slopes
-	PBF3	Pass Canyon very cobbly coarse sandy loam, 5 to 30 percent slopes, severely eroded
-	PCF2	Pass Canyon very rocky coarse sandy loam, 5 to 30 percent slopes, eroded
PdB	-	Pavant silt loam, 1 to 3 percent slopes
-	PEC	Pavant cobbly loam, 1 to 6 percent slopes
-	PFG	Pavant extremely rocky loam, 30 to 40 percent slopes
-	PGB	Penoyer silt loam, 1 to 3 percent slopes
-	PHD	Penoyer-Hiko Peak association, 1 to 10 percent slopes
-	PID2	Phage loam, 3 to 10 percent slopes, eroded
PkD2	-	Phage gravelly loam, 3 to 10 percent slopes, eroded
-	PLF2	Phage cobbly loam, 3 to 30 percent slopes, eroded
-	PLG2	Phage cobbly loam, 30 to 50 percent slopes, eroded
-	PMF2	Phage very cobbly loam, 3 to 30 percent slopes, eroded
-	PNG2	Phage very rocky loam, 30 to 60 percent slopes, eroded
-	POF2	Phage-Black Ridge association, 3 to 30 percent slopes, eroded
-	PPF2	Phage-Pass Conyon association, 3 to 30 percent slopes, eroded
-	PRF2	Phage-Red Butte association, 3 to 30 percent slopes, eroded
-	PSF2	Phage-Ushar complex, 3 to 30 percent slopes, eroded
PtB	-	Pharo loam, 1 to 3 percent slopes
PtD	-	Pharo loam, 3 to 10 percent slopes
-	PUD2	Pharo loam, 3 to 10 percent slopes, eroded
-	PVF	Pharo very cobbly loam, 3 to 30 percent slopes
-	PWF2	Pharo-Ushar association, 3 to 30 percent slopes, eroded
PxB	-	Poganeab clay loam, 1 to 3 percent slopes
PyB	-	Poganeab clay loam, deep over clay, 1 to 3 percent slopes
-	RBG2	Red Butte very cobbly loam, 3 to 50 percent slopes, eroded
-	RCG2	Red Butte very rocky loam, 30 to 50 percent slopes, eroded
-	RDG2	Red Butte association, 3 to 60 percent slopes, eroded
-	REG2	Red Butte-Deer Creek association, 30 to 50 percent slopes, eroded
-	RFF2	Red Butte-Flowell association, 3 to 30 percent slopes, eroded
-	RGF2	Red Butte-Phage association, 3 to 30 percent slopes, eroded
RhB	-	Red Rock silt loam, 1 to 3 percent slopes
-	RK	Riverwash
-	RLE	Rob Roy loam, 1 to 15 percent slopes
-	RMF	Rob Roy very cobbly loam, 10 to 30 percent slopes
-	RNF	Rob Roy very rocky loam, 10 to 30 percent slopes
-	RO	Rock land
-	SCC	Sheeprock coarse sandy loam, 2 to 6 percent slopes
-	SDF	Sheeprock gravelly coarse sandy loam, 10 to 25 percent slopes
-	SEF	Sheeprock-Cokel complex, 3 to 30 percent slopes
-	SFF	Sheeprock-Ushar complex, 3 to 30 percent slopes
-	SHF	Shotwell very rocky loam, 10 to 30 percent slopes
-	SKE	Sigurd gravelly loam, 3 to 15 percent slopes
-	SLD	Snake Hollow coarse sandy loam, 3 to 10 percent slopes
-	SLD2	Snake Hollow coarse sandy loam, 3 to 10 percent slopes, eroded
-	SNE3	Snake Hollow-Blackett association, 3 to 20 percent slopes, severely eroded
-	SOD	Snake Hollow-Blue Star association, 3 to 10 percent slopes
-	SRF	Snake Hollow very rocky loam, gravelly subsoil variant, 10 to 30 percent slopes
-	UAD2	Ushar sandy loam, 3 to 10 percent slopes, eroded
-	UHC3	Ushar loam, 1 to 6 percent slopes, severely eroded
-	UHD	Ushar loam, 3 to 10 percent slopes
-	UHD2	Ushar loam, 3 to 10 percent slopes, eroded
-	ULF2	Ushar cobbly loam, 3 to 30 percent slopes, eroded
-	UMF2	Ushar rocky loam, 5 to 30 percent slopes, eroded
-	UND	Ushar-Etta association, 3 to 10 percent slopes
-	UOD2	Ushar-Mill Hollow association, 1 to 10 percent slopes, eroded
-	UOF2	Ushar-Mill Hollow association, 10 to 30 percent slopes, eroded
-	URF	Ushar-Mosida association, 3 to 30 percent slopes
-	USF	Ushar-Murdock association, 3 to 25 percent slopes
-	UTF2	Ushar-Phage association, 3 to 30 percent slopes, eroded
-	UTG2	Ushar-Phage association, 30 to 70 percent slopes, eroded
-	WBG2	Wallsburg very cobbly loam, 30 to 60 percent slopes, eroded
-	WCG2	Wallsburg association, 30 to 60 percent slopes, eroded
-	WMG2	Wallsburg-Maple Mountain association, 3 to 60 percent slopes, eroded
Wt	-	Wet alluvial land
-	YAC	Yardley loam, 1 to 6 percent slopes
-	YME	Yardley-Maple Mountain association, 1 to 25 percent slopes
-	YWF	Yardley-Wallsburg association, 3 to 30 percent slopes

INDEX TO MAP SHEETS

BEAVER-COVE FORT AREA
UTAH
PARTS OF BEAVER AND MILLARD COUNTIES

Scale 1:190,080

1 0 1 2 3 4 Miles

N

112°50′ 112°40′ 38°40′ 38°30′ 38°20′ 38°10′

T. 24 S. T. 25 S. T. 26 S. T. 27 S. T. 28 S. T. 29 S. T. 30 S.

R. 9 W. R. 8 W. R. 7 W. R. 6 W.

MILLARD COUNTY BEAVER COUNTY IRON COUNTY

Black Rock Volcano

Eightmile Point

DOG VALLEY

Cove Fort

Granite Peak

Manderfield

BEAVER

Adamsville

Greenville

Minersville

Minersville Res

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Creek Cove Canyon Water Canyon Wildhorse Canyon Ranch Canyon Corral Canyon Cherry Creek Cunningham Wash Solomans Hollow Cr Cave Canyon Mineral Pass Road Gulch Lincoln Chalk Hollow Chokecherry Canyon Wildcat Creek Big Hollow Indian Creek North Creek South Creek Beaver River Pine Cr Rocky Cr

Mountains

Boundary

National Forest

Fishlake National Forest