United States Department of Agriculture

Soil Conservation Service

In cooperation with United States Department of the Interior, Bureau of Land Management; University of Idaho, College of Agriculture; and Idaho Soil Conservation Commission

Soil Survey of Bannock County Area, Idaho,

Parts of Bannock and Power Counties

HOW TO USE

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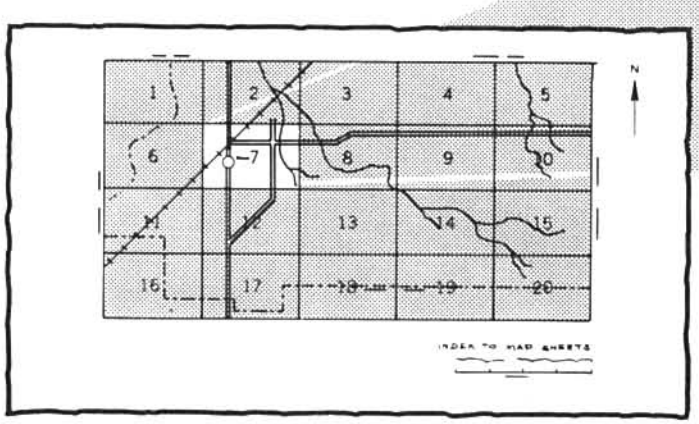

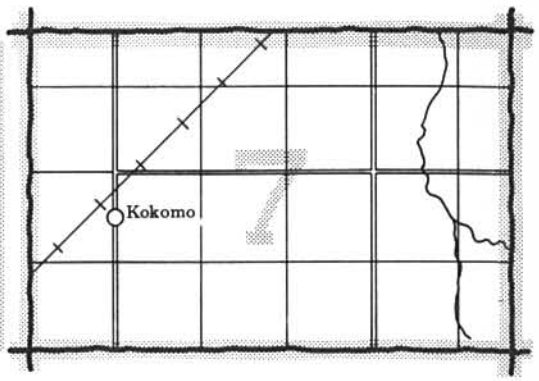

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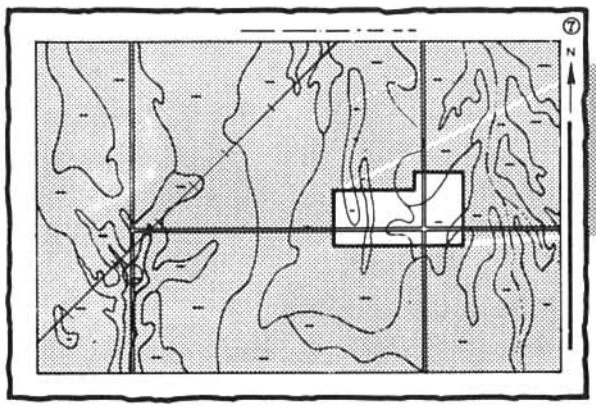

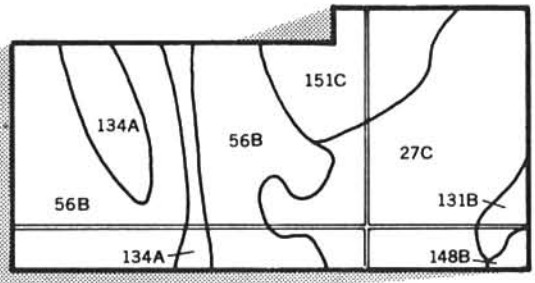

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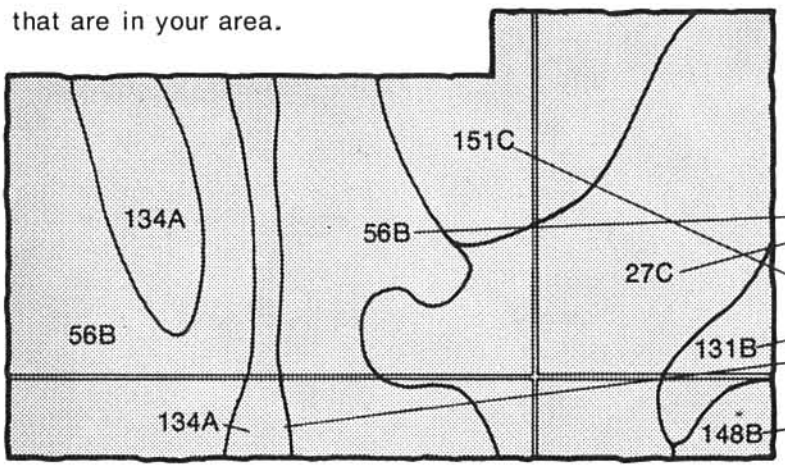

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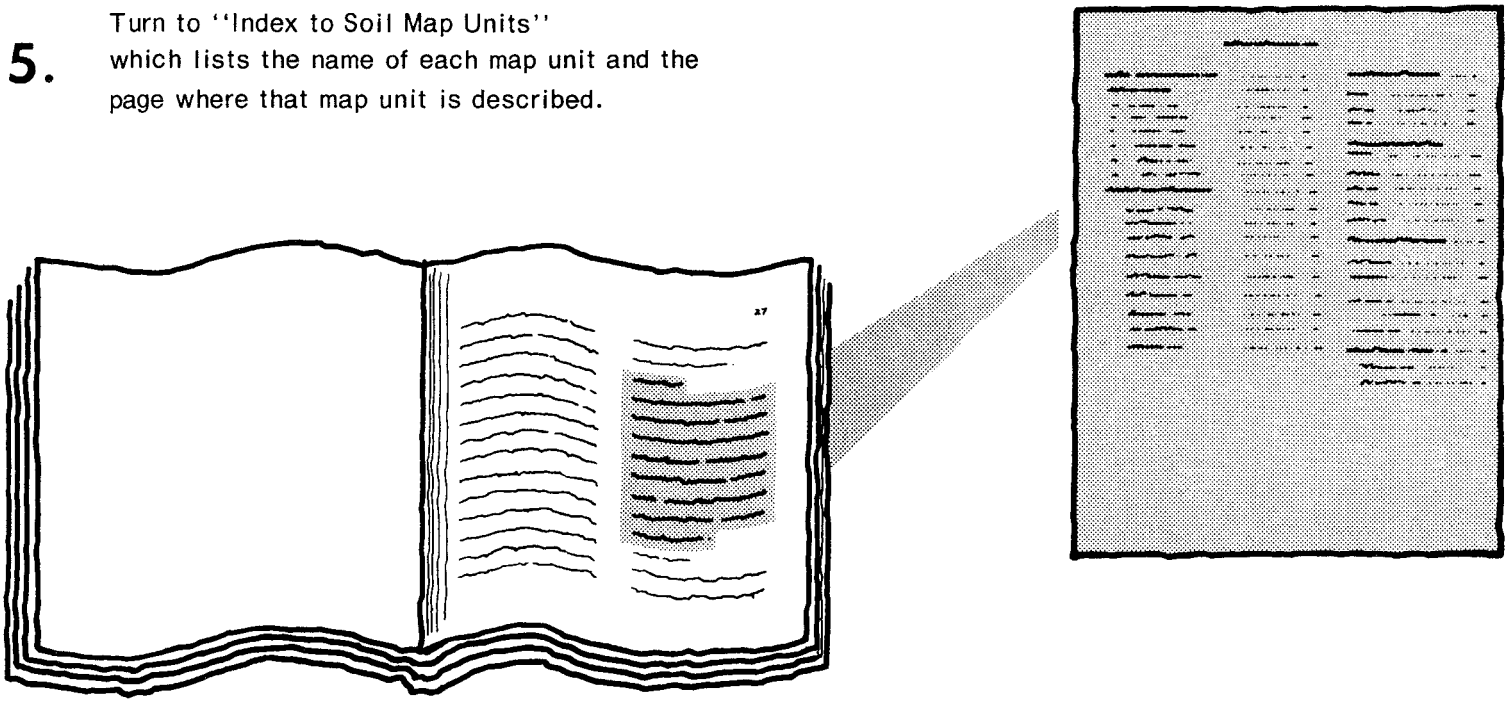
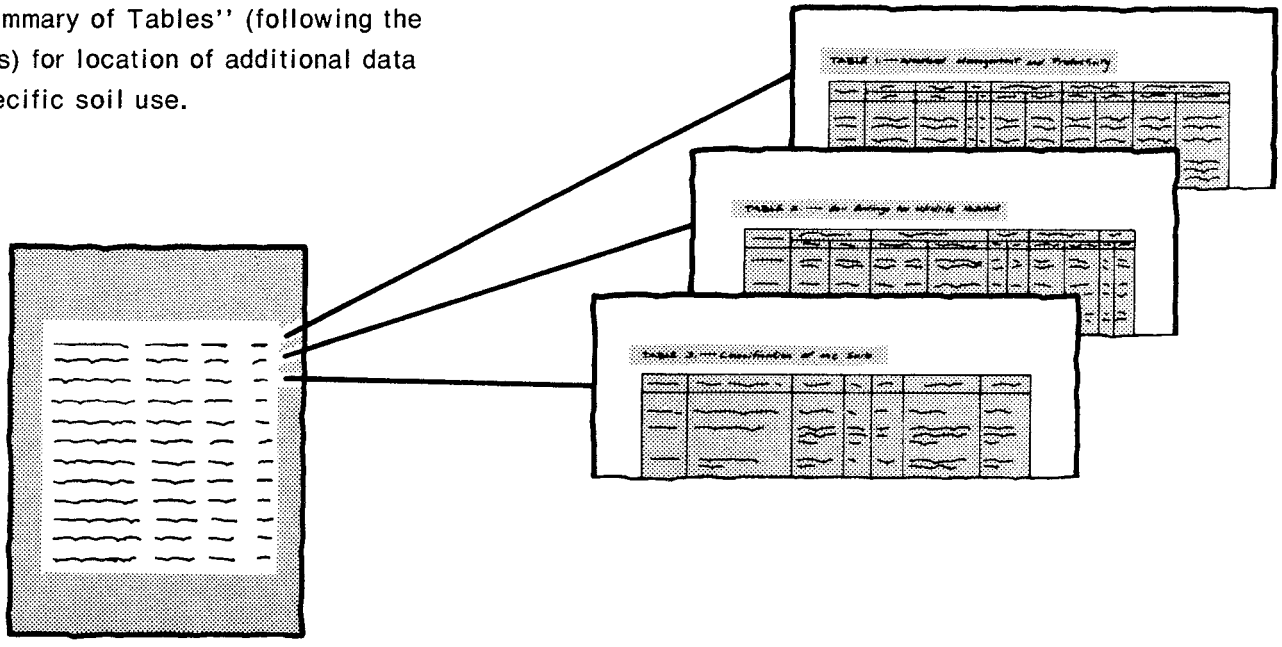
THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



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



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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Soil Conservation Service and the United States Department of the Interior, Bureau of Land Management; the University of Idaho, College of Agriculture; and the Idaho Soil Conservation Commission. It is part of the technical assistance furnished to the Portneuf Soil and Water Conservation District.

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

Cover: An area of Lanoak soils in center; Greys and Camelback soils in foreground; and Camelback and Pavohroo soils on mountains in background.

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Foreword

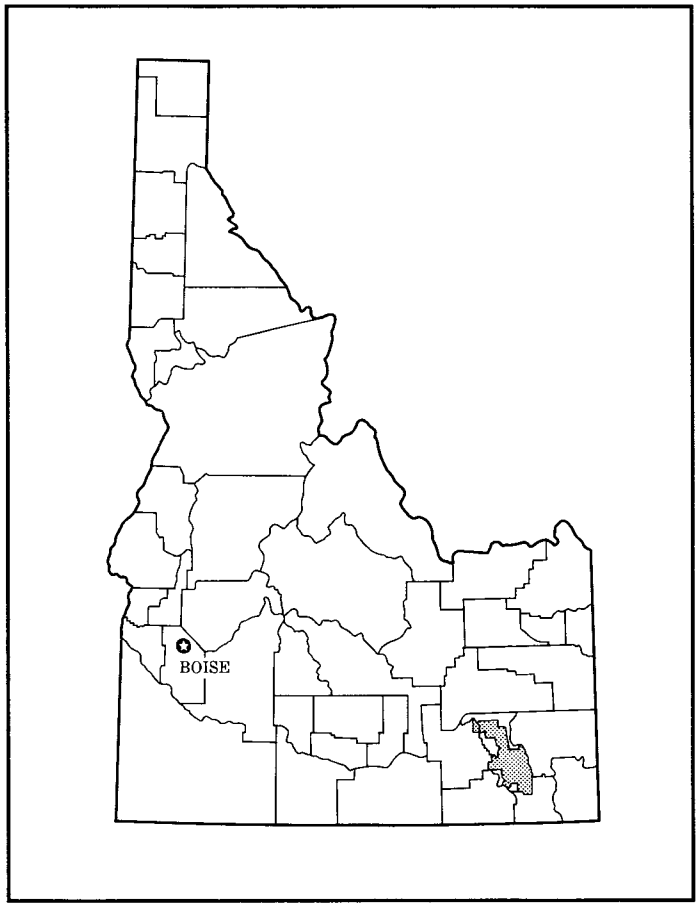
This soil survey contains information that can be used in land-planning programs in Bannock County Area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact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

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

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

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

Stanley N. Hobson
State Conservationist
Soil Conservation Service



Location of Bannock County Area, Parts of Bannock and Power Counties in Idaho.

Soil Survey of
Bannock County Area, Idaho
Parts of Bannock and Power Counties

By Chad L. McGrath, Soil Conservation Service

Fieldwork by Chad L. McGrath, Theron A. Meyer, III, Harold W. Biggerstaff, and Scott D. Hutchinson, Soil Conservation Service, and John D. Grieve, Rulon W. Winward, and Thomas L. Clark, Idaho Soil Conservation Commission

United States Department of Agriculture, Soil Conservation Service
In cooperation with
United States Department of the Interior, Bureau of Land Management;
University of Idaho, College of Agriculture; and
Idaho Soil Conservation Commission

BANNOCK COUNTY AREA is in the southeastern part of Idaho. It includes all of Bannock County, except contiguous parts of the Caribou National Forest and the Fort Hall Indian Reservation. It also includes a small part of Power County, west of Pocatello. The total area is 504,610 acres, or about 788 square miles. Pocatello, the county seat of Bannock County, had a population of 46,340 in 1980.

The survey area consists of generally north-south trending mountain ranges and valleys. The Bannock Range is in the western part of the area, the Pocatello Range is in the north-central part, and the Portneuf Range is in the eastern part. The Portneuf River and Marsh Creek are the major drainageways in the area. The Portneuf River enters the survey area in the northeastern part and crosses the northern part. It exits the survey area in the northwestern corner. The valley of the Portneuf River is relatively narrow except in the northwestern part of the survey area, where it opens onto the Snake River Plain at Pocatello. Marsh Creek Valley is a very broad valley extending through the central part of the survey area. It is typified by deeply dissected and truncated coalesced fan terraces on either side of the valley.

The lowest point in the survey area, which is about 4,400 feet, is northwest of Pocatello, where the Portneuf River exits the survey area. The highest point in the survey area is Sedgwick Peak, which is about 9,160 feet and is in the southeastern part of the area.

This soil survey was completed to provide soil resource data for long-range planning and development, farm and ranch planning, woodland and rangeland management, urban planning and development, and many other uses. The more intensively used and managed cropland and urban areas were mapped in more detail than the less intensively used and managed woodland and rangeland; however, the map units were constructed to try to meet the present and anticipated needs of the land users and managers.

An older survey, "Soil Survey of the Portneuf Area, Idaho," was published in 1921 (*9*). This earlier survey covers most of the present survey. The present survey, however, updates the earlier survey and provides additional information and larger maps that show the soils in greater detail.

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

General Nature of the Survey Area

This section gives general information concerning the survey area. It discusses history and development, natural resources, farming, and climate.

History and Development

Routes through the Rocky Mountains were important from the very beginning of this nation's westward expansion. Trails and eventually roads, highways, and railroads were constructed along natural routes such as the Portneuf and Marsh Valleys.

In the early 1800's, trappers found a wealth of fur-bearing animals along the Portneuf River and Marsh Creek and their tributaries. This led Nathaniel Wyeth to build a trading post in 1834. The trading post, called Fort Hall, was located about 12 miles northwest of the present site of Pocatello. By the 1840's, the fur trade began to decline; however, Fort Hall became an important way station for settlers following the Oregon Trail.

While the emigrants were moving westward, mining activity in central and northern Idaho and in Montana also brought increased traffic through the area. By the 1860's, Mormon settlers were establishing farms and ranches in the southern part of what was to become Bannock County.

With all the commercial activity that was taking place to the north, Mormon leaders in Salt Lake City felt that a railroad to the area could be built. In 1872, construction of the Utah Northern Railroad was begun. The cost and labor for the railroad were shared by the people living in the areas where the track was laid in Utah. The system was not feasible in the sparsely settled Idaho regions, and construction was abandoned.

In 1878, Jay Gould and his Union Pacific associates refinanced the Utah Northern, renamed it the Utah and Northern Railroad, and continued laying track up Marsh Valley and Portneuf Valley to Pocatello.

In 1881, work began on the Oregon Short Line Railroad from Granger, Wyoming, to Huntington, Oregon. This railroad also followed the Portneuf Valley through the area to Pocatello. With the two railroads, Pocatello began to grow and prosper and became a railroad center, which it has remained ever since. Farmers and ranchers began to settle in the area because of the ease with which they could ship their crops and livestock. Since then, farming and ranching have become very important industries in the area.

Bannock County was established in March, 1893, when Bingham County was divided. The southern part was called Bannock in honor of the Indians who had inhabited the area. Pocatello is the seat of government and the principal city in the county today. Other cities and communities in the county are Swan Lake, Downey, Virginia, Arimo, McCammon, Lava Hot Springs, and Inkom. Most of these cities and communities started as railroad camps but now are primarily dependent on agriculture.

Transportation facilities are presently supplied by railroads, highways, and an airport at Pocatello. Union Pacific Railroad maintains a regional headquarters at Pocatello. Interstate Highway 15 runs the length of Bannock County from north to south. Interstate Highway 86 connects Interstate 15 with points west at Pocatello. Air passenger and freight service is provided at the Pocatello Municipal Airport.

Because of the good transportation facilities, several major industries have located in and around Pocatello. Idaho State University is also located in Pocatello. These industries along with the university, agriculture, and the railroad continue to be the backbone of the economy of the area.

Natural Resources

Soil and water are the most important natural resources in the survey area. Among the marketable products derived from the soil are the crops produced on the farms; the livestock that graze the rangeland, pastures, and woodland; and the limited amount of timber harvested.

Water in the survey area is used primarily for domestic purposes, livestock, and irrigation. Springs and deep wells supply most of the water used for domestic purposes, although the City of Pocatello does obtain a percentage of its water supply from Mink Creek and Gibson Jack Creek. Perennial streams and spring developments provide adequate supplies of water for livestock in most of the survey area. Irrigation water in the central part of the area is supplied mainly by the Portneuf River and Marsh Creek. The Fort Hall Main Canal, which originates at the Blackfoot Equalizing Reservoir, about 20 miles northeast of Pocatello, supplies most of the irrigation water for the area north of Pocatello. A few deep wells are also used for irrigation, and water from a few of the smaller perennial streams is used to irrigate small areas.

Most of the mining in the area is for the production of sand and gravel. These deposits are plentiful at the lower elevations in the survey area, especially in the Downey, Virginia, Arimo, and Pocatello areas. Limestone is quarried for the only cement plant in Idaho, at Inkom. A small amount of quartzite is quarried southwest of Pocatello to use as flux in the extraction of elemental phosphorus. There has been a considerable amount of metallic ore prospecting, but the ore bodies found have not proven profitable to mine. A very small amount of peat has been mined along Marsh Creek. There are also deposits of volcanic ash that may be suitable for use as abrasives or in the production of cinder blocks.

Farming

The farming and ranching industries in the survey area have flourished since the coming of the railroad. The first settlers were primarily ranchers; however, as these settlers and those that followed found, the soils in the area are quite fertile. They then began to plow up the sagebrush and plant crops. With the development of the tractor and bigger and better machinery, especially shortly before and after World War II, large acreages of rangeland were converted to cropland. The majority of the cropland in the survey area is nonirrigated, with the exception of the area north of Pocatello and some of the areas at lower elevations in the central part of the area.

Wheat, barley, and a small amount of alfalfa hay are the primary crops raised in the nonirrigated areas. Wheat, barley, potatoes, and alfalfa hay are the major crops in the irrigated areas. There is also irrigated meadow hay and pasture along the Marsh Creek bottom. The ranching industry is now primarily centered around beef cattle, although sheep were quite important during the early days of ranching. There are also a number of dairies in the survey area. Most of the farms and ranches in the area have a combination farming and livestock operation.

Most of the nonirrigated cropland in the survey area is gently sloping to moderately steep. As early as 1930, the local farmers could see the erosion and the resultant siltation and increased flooding along the streams as this sloping land was converted from rangeland to cropland. They realized the need for soil and water conservation measures and practices to control the devastating effects of soil erosion. The Portneuf Soil and Water Conservation District was established May 18, 1940. It was the second legal soil conservation district to be formed in Idaho.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

The Rocky Mountains partly shield the survey area from strong arctic winds, so winters are generally not too severe, though cold. In summer Pacific Ocean winds are partially blocked; days are hot, but nights are fairly cool. Precipitation, except in mountainous areas, is scant in summer, but in many places it is adequate during the cooler parts of the year for nonirrigated small grain or rangeland. The snowpack accumulation at high elevations supplies irrigation water for intensive agriculture in parts of the lowland.

No weather stations are in the survey area. The weather station for Pocatello is located at the airport, 7 miles west of Pocatello and 3 miles west of the western boundary of the survey area. This station, however, was not chosen because the data from this station would represent only the small part of the survey area from Pocatello north.

The climatic information for the survey area is taken from data collected at Arbon, Idaho. Arbon is 10 miles west of the western boundary of the survey area, in the next major north-south oriented valley. It was selected because the climate is similar to that in most of the survey area.

The climate is extremely variable in the survey area. It is primarily related to changes in elevation. There is also some rain shadow effect created by the variability in relief of the mountain ranges.

The driest and warmest part of the survey area is north of Pocatello. This part is at the lowest elevations in the survey area. The average annual temperature is about 47 degrees F, the average annual precipitation is about 10 inches, and the average frost-free season is about 120 days. With increased elevation, the average annual temperature decreases, the average annual precipitation increases, and the average frost-free season decreases. At the highest elevations in the area, the average annual temperature is about 37 degrees, the average annual precipitation is about 30 inches, and the average frost-free season is less than 50 days.

The information given in the following paragraphs is representative for the intermediate elevations, which include the majority of the nonirrigated cropland in the survey area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Arbon, Idaho, in the period 1962-79. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 25 degrees and the average daily minimum temperature is 16 degrees. The lowest temperature on record, which occurred at Arbon on January 9, 1977, is -28 degrees. In summer, the average temperature is 65 degrees and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred at Arbon on July 19, 1966, is 101 degrees.

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

The total annual precipitation is 15.6 inches. Of this, 7 inches, or 45 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 5 inches. The heaviest 1-day rainfall during the period of record was 3.2 inches at Arbon on December 23, 1964. Thunderstorms occur on about 25 days each year, and most occur in summer.

The average seasonal snowfall is 69 inches. The greatest snow depth at any one time during the period of

record was 30 inches. On an average of 14 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 40 percent. Humidity is higher at night, and the average at dawn is about 70 percent. The sun shines 80 percent of the time in summer and 40 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

How This Survey Was Made

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

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

Individual soils on the landscape commonly merge gradually onto one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

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

While the soil survey was in progress, samples of some of the soils in the area were collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses and under different levels of management. Some interpretations were modified to fit local conditions, and some new interpretations were developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

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

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

General Soil Map Units

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

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

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

The general soil map at the back of this survey does not join in all instances with the general soil maps of adjacent survey areas. Differences in the maps have resulted from differences in the occurrence of soil patterns and from recent advances in classification.

The general map units in this survey have been grouped into general kinds of landscape for broad interpretive purposes (figs. 1 and 2). Each of the broad groups and the map units in each group are described in the following pages.

Map Unit Descriptions

Soils on flood plains and low terraces

Two map units are on these landscape positions. They make up about 4 percent of the survey area.

1. Downata-Bear Lake-Tendoy

Very deep, very poorly drained and poorly drained soils that formed in silty alluvium and organic material and are subject to frequent flooding

This map unit is mainly along the major drainageways in the survey area. It is mainly on flood plains and low terraces. Slopes are 0 to 1 percent. Elevation ranges from 4,500 to 5,400 feet. The average annual precipitation is 12 to 16 inches, the average annual air temperature is 41 to 45 degrees F, and the average frost-free season is 80 to 100 days.

This unit makes up about 2 percent of the survey area. It is about 30 percent Downata and similar soils, 25 percent Bear Lake and similar soils, and 10 percent Tendoy and similar soils. The remaining 35 percent is components of minor extent.

Downata soils are on flood plains and low terraces. These soils are very poorly drained. The drainage of the Downata soils has been altered in most areas, changing it to poorly drained. These soils formed in silty alluvium derived from mixed sources. The surface layer is silt loam. Below this to a depth of 60 inches or more is silt loam and silty clay loam.

Bear Lake soils are on flood plains and low terraces. These soils are very poorly drained. The drainage of the Bear Lake soils has been altered in most areas, changing it to poorly drained. These soils formed in silty alluvium derived from mixed sources. The surface layer is silt loam. The subsoil is silt loam or silty clay loam. Below this to a depth of 60 inches or more is silt loam or silty clay loam.

Tendoy soils are on flood plains. These soils are very poorly drained. They formed in organic material derived dominantly from herbaceous plants. The surface is covered with a thin layer of silty alluvium. Below this to a depth of 60 inches or more is organic material.

Of minor extent in this unit are the poorly drained Bear Lake Variant and Inkom soils and the well drained Arbone, Wursten, and Holmes soils. The Arbone, Wursten, and Holmes soils are on higher terraces and are not affected by a high water table or by flooding.

This unit is used mainly for hay and pasture. It is also used for wildlife habitat.

If this unit is used for hay and pasture, the main limitation is seasonal wetness.

This unit is well suited to use as wetland wildlife habitat. The soils in the unit produce food and cover for ducks, geese, herons, sandhill cranes, mink, beaver, and muskrats.

The main limitations of this unit for homesite development are a hazard of flooding and a seasonal high water table and the shrink-swell potential and excess humus of the Tendoy soils. The main limitations of this unit for local roads and streets and for recreational development are a hazard of flooding and a seasonal high water table.

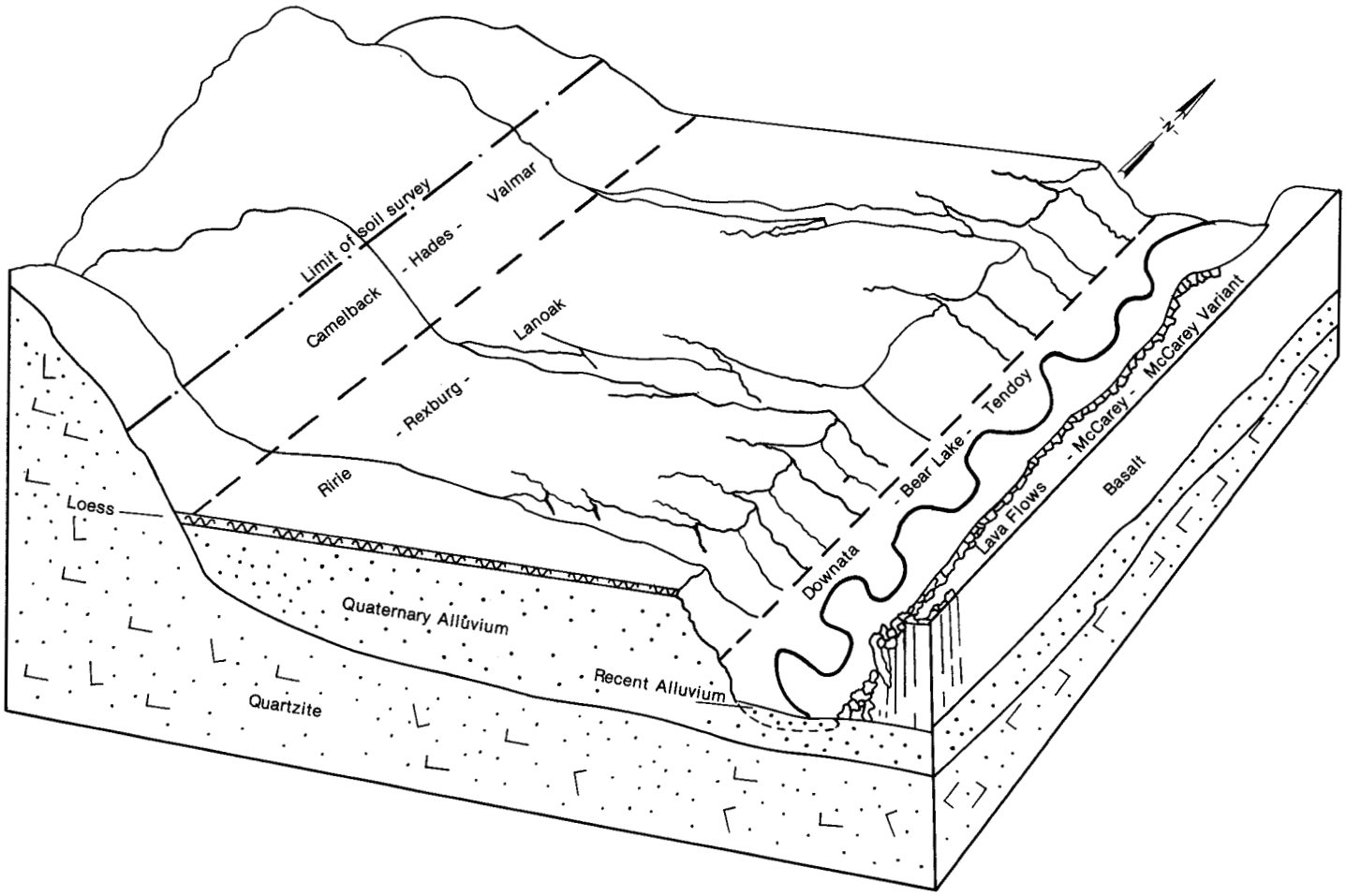


Figure 1.—Cross section of Marsh Valley, west of McCammon, showing relationship between the soils and parent material in general soil map units I, 4, 5, and 6.

2. Inkom-Joevar

Very deep, moderately well drained and well drained soils that formed in silty alluvium

This map unit is primarily along the Portneuf River and Marsh Creek and their tributaries. It is mainly on flood plains and terraces. Slopes are 0 to 3 percent. Elevation ranges from 4,350 to 5,400 feet. The average annual precipitation is 10 to 16 inches, the average annual air temperature is 42 to 48 degrees F, and the average frost-free season is 80 to 120 days.

This unit makes up about 2 percent of the survey area. It is about 45 percent Inkom and similar soils and 30 percent Joevar and similar soils. The remaining 25 percent is components of minor extent.

Inkom soils are on terraces and flood plains. These soils are moderately well drained. The Inkom soils formed under conditions of poor drainage; because of altered drainage, however, these soils are now moderately well drained. They formed in silty alluvium derived from mixed sources. The soils are silt loam throughout.

Joevar soils are on terraces. These soils are well drained. They formed in silty alluvium derived dominantly from loess. The soils are silt loam throughout.

Of minor extent in this unit are the well drained McDole, McDole Variant, Arbone, Holmes, and Wursten soils and the poorly drained Downata and Bear Lake soils. The McDole and McDole Variant soils are along the Portneuf River, near the City of Pocatello. The Arbone, Holmes, and Wursten soils are on terraces and terrace breaks. The Downata and Bear Lake soils are in depressional areas and on low terraces adjacent to streams.

This unit is used mainly for nonirrigated and irrigated crop production. It is also used for wildlife habitat.

The main limitations of this unit for nonirrigated crop production are a hazard of flooding and limited precipitation. The main limitation of this unit for irrigated crop production is a hazard of flooding.

This unit is well suited to use as openland wildlife habitat. The soils in the unit produce food and cover for Hungarian partridge, ring-necked pheasant, meadowlark, cottontail rabbit, fox, and coyote. Clean-till farming practices limit wildlife habitat on this unit.

The main limitation of this unit for homesite development is a hazard of flooding. The main limitations for local roads and streets are a hazard of flooding and frost action. The main limitations for recreational development are a hazard of flooding, a seasonal high water table, and dustiness.

Soils on high terraces

One map unit is on these landscape positions. It makes up about 7 percent of the survey area.

3. Arimo-Downey-Bahem

Very deep, well drained soils that formed in loess and silty alluvium overlying alluvial sand, gravel, cobbles, and stones

This unit is characterized by broad, nearly level to gently sloping terraces bordered by escarpments cut by streams. Slopes are 0 to 8 percent. Elevation ranges from 4,400 to 4,900 feet. The average annual precipitation is 9 to 16 inches, the average annual air temperature is 42 to 49 degrees F, and the average frost-free season is 80 to 130 days.

This unit makes up about 7 percent of the survey area. It is about 20 percent Arimo and similar soils, 20 percent

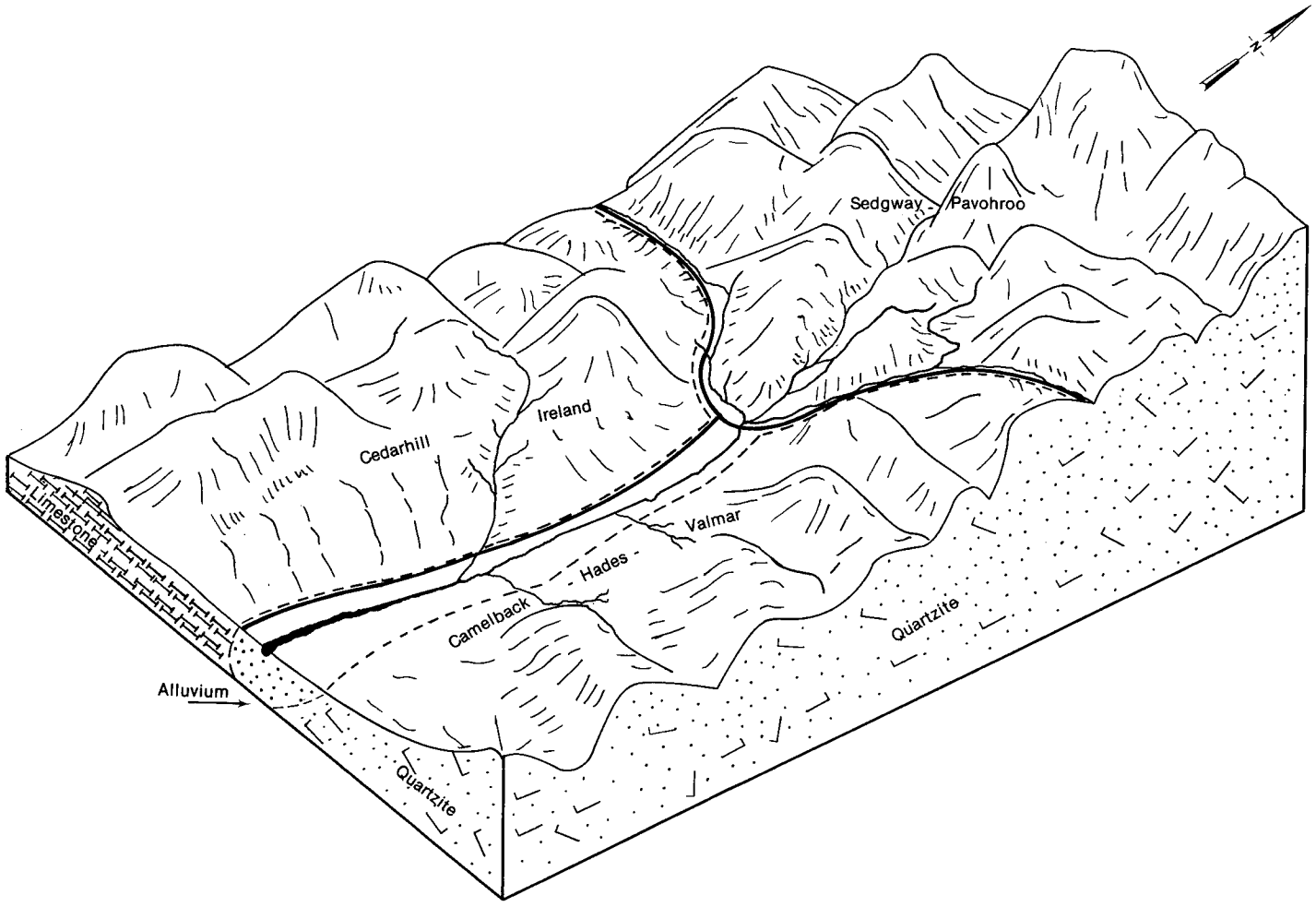


Figure 2.—Relationship between the soils and parent material in general soil map units 6, 7, and 8.

Downey and similar soils, and 10 percent Bahem and similar soils. The remaining 50 percent is components of minor extent.

Arimo soils are on terraces. Sand and gravel are at a depth of 20 to 40 inches. The soils formed in loess and silty alluvium overlying alluvial sand and gravel of mixed mineralogy. The soils are silt loam to a depth of 33 inches. Below this to a depth of 60 inches or more is extremely gravelly coarse sand.

Downey soils are on terraces. Sand and gravel are at a depth of 12 to 20 inches. The soils formed in silty alluvium overlying alluvial sand and gravel of mixed mineralogy. The soils are silt loam to a depth of 17 inches. Below this to a depth of 60 inches or more is extremely gravelly coarse sand.

Bahem soils are on terraces. Sand, gravel, cobbles, and stones are at a depth of 40 to 60 inches. The soils formed in silty alluvium overlying flood-deposited sand, gravel, cobbles, and stones. The soils are silt loam to a depth of 49 inches. Below this to a depth of 60 inches or more is extremely cobbly sand.

Of minor extent in this unit are the very deep Broxon, Broncho, Hondoho, and Wursten soils and Urban land. Urban land consists of areas that are largely covered by concrete, asphalt, buildings, or other impervious surfaces that obscure the soils so that identification is not feasible. The Broxon soils are on terraces in and north of Pocatello. The Broncho soils are on terrace escarpments north of Pocatello. The Hondoho and Wursten soils are on terrace escarpments in the Downey area. The Urban land is within the city limits of Pocatello and Chubbuck.

This unit is used for irrigated and nonirrigated crops, livestock grazing, wildlife habitat, and urban and homesite development.

The main limitations of this unit for irrigated crop production are the droughtiness of the Downey soils and the hazard of water erosion. The main limitations for nonirrigated crop production are the droughtiness of the Downey soils, low precipitation, and the hazard of water erosion.

This unit is well suited to livestock grazing. It has few limitations.

This unit is well suited to use as openland and rangeland wildlife habitat. The soils in the unit that are farmed produce food and cover for Hungarian partridge, ring-necked pheasant, meadowlark, cottontail rabbit, fox, and coyote. Clean-till farming practices limit openland wildlife habitat on this unit. The natural vegetation produced on the unit provides food and cover for mule deer, sage grouse, coyote, sharp-tailed grouse, Hungarian partridge, and jackrabbits.

If this unit is used for homesite and urban development, the main limitations are poor filter material for septic tank absorption fields and the hazard of seepage from sewage lagoons and sanitary landfills. The main limitation of this unit for local roads and streets is the hazard of frost action. The main limitation for recreational development is a dusty surface layer.

Lava flows and soils on basalt flows

One map unit is on these landscape positions. It makes up about 2 percent of the survey area.

4. Lava flows-McCarey-McCarey Variant

Lava flows, and moderately deep and shallow, well drained soils that formed in loess, silty alluvium, and material weathered from basalt

This unit is characterized by an undulating basalt flow with many exposed areas of Lava flows. Slopes are 1 to 8 percent. Elevation ranges from 4,500 to 4,800 feet. The average annual precipitation is 11 to 16 inches, the average annual air temperature is 43 to 48 degrees F, and the average frost-free season is 80 to 125 days.

This unit makes up about 2 percent of the survey area. It is about 30 percent Lava flows, 20 percent McCarey and similar soils, and 15 percent McCarey Variant and similar soils. The remaining 35 percent is components of minor extent.

Lava flows consist of exposed basalt. They are highly fractured and have many crevices. Vegetation is mostly moss and lichens. The material in some crevices supports serviceberry, mountain big sagebrush, Rocky Mountain maple, currant, and antelope bitterbrush.

McCarey soils are on basalt flows. These soils are moderately deep. They formed in loess and silty alluvium and in material weathered from basalt. The soils are silt loam throughout. Unweathered basalt is at a depth of 20 to 40 inches.

McCarey Variant soils are on basalt flows. These soils are shallow. The soils formed in loess and silty alluvium and in material weathered from basalt. The surface layer is extremely stony silt loam. The subsoil is very stony silt loam. Unweathered basalt is at a depth of 10 to 20 inches.

Of minor extent in this unit are very deep Arbone soils, moderately deep Portino soils, shallow Thornock soils, Rubble land, and vertical cliffs. The Arbone soils are in concave areas and on terraces adjacent to the basalt flow. The Portino and Thornock soils are on the basalt flow, south of the city of Pocatello. The Rubble land and vertical cliffs are mainly along the escarpments that border the basalt flow, along Marsh Creek and the Portneuf River.

Most areas of this unit are used for livestock grazing and wildlife habitat. A few areas are used for irrigated and nonirrigated crop production and for homesite development.

If this unit is used for livestock grazing, the main limitations are the extremely stony surface layer of the McCarey Variant soils and the areas of Lava flows.

This unit is suited to rangeland wildlife habitat. The natural vegetation produced by the soils in this unit

provides food and cover for mule deer, sage grouse, coyote, and sharp-tailed grouse.

This unit is poorly suited to use as irrigated or nonirrigated cropland. It is limited mainly by the areas of Lava flows and the extremely stony surface layer of the McCarey Variant soils.

This unit is poorly suited to homesite development. It is limited mainly by the areas of Lava flows, the extremely stony surface layer of the McCarey Variant soils, and the depth to bedrock. The main limitations for local roads and streets are the areas of Lava flows, the extremely stony surface layer of the McCarey Variant soils, depth to bedrock, and the hazard of frost action. The main limitations for recreational development are the areas of Lava flows, the extremely stony surface layer of the McCarey Variant soils, depth to bedrock, and the dusty surface layer of the McCarey soils.

Soils on fan terraces and foothills

One map unit is on these landscape positions. It makes up about 35 percent of the survey area.

5. Ririe-Rexburg-Lanoak

Very deep, well drained soils that formed in loess and in silty alluvium derived from loess

Areas of this map unit are throughout the survey area. This unit is characterized by rounded foothills and truncated coalesced fan terraces that have very deeply dissected drainageways. Slopes are 1 to 50 percent. Elevation ranges from 4,400 to 6,600 feet. The average annual precipitation is 10 to 18 inches, the average annual air temperature is 41 to 51 degrees F, and the average frost-free season is 75 to 125 days.

This unit makes up about 35 percent of the survey area. It is about 30 percent Ririe and similar soils, 15 percent Rexburg and similar soils, and 15 percent Lanoak and similar soils. The remaining 40 percent is components of minor extent.

Ririe soils are on foothills and fan terraces. They formed in loess and silty alluvium derived from loess. The soils are silt loam to a depth of 60 inches or more.

Rexburg soils are on foothills and fan terraces. They formed in loess and silty alluvium derived from loess. The soils are silt loam to a depth of 60 inches or more.

Lanoak soils are on north-facing side slopes of the higher foothills and fan terraces. They formed in loess and silty alluvium derived from loess. The soils are silt loam to a depth of 60 inches or more.

Of minor extent in this unit are the Pocatello, Bancroft, Joes, Watercanyon, Manila, Greys, Hondoho, Arbone, Broncho Variant, Coalbank, and Cedarhill soils; the moderately well drained Oxford and Banida soils; and the moderately deep Trailcreek soils. The Pocatello soils are on foothills and fan terraces near the city of Pocatello. The Broncho Variant soils are on terrace escarpments near the city of Pocatello. Bancroft soils are on foothills and fan terraces in the more moist areas of the unit. Joes soils are on fan terraces west of the city of Arimo. Watercanyon soils are on south- and west-facing side slopes and ridgetops. Manila soils are on foothills and fan terraces east of the city of Downey. Greys soils are in the higher, cooler, more moist areas. The Hondoho and Arbone soils are on terrace escarpments below the Ririe and Rexburg soils. Cedarhill soils are on south- and west-facing side slopes of foothills. The Oxford and Banida soils are on lake terraces in the Swan Lake area. The Coalbank and Trailcreek soils are associated with outcrops of volcanic ash.

Most areas of this unit are used for nonirrigated crop production and openland wildlife habitat. A few areas are used for irrigated crop production, livestock grazing, and homesite and urban development.

The main limitations of this unit for nonirrigated crop production are the hazard of water erosion, limited precipitation in the drier areas of the unit, and a limited frost-free season in the cooler areas.

The soils in this unit produce food and cover for Hungarian partridge, ring-necked pheasant, mourning dove, meadowlark, cottontail rabbit, fox, and coyote. Clean-till farming practices limit openland wildlife habitat.

If this unit is used for irrigated crop production, the main limitations are the hazard of water erosion and a limited frost-free season at the higher elevations. This unit is well suited to livestock grazing.

The main limitations of this unit for homesite, urban, and recreational development are slope, a hazard of water erosion, and dustiness. The main limitations of this unit for local roads and streets are slope and the hazard of frost action.

Soils on foothills and mountains

Three map units are on these landscape positions. They make up about 52 percent of the survey area.

6. Camelback-Hades-Valmar

Very deep to moderately deep, well drained, noncalcareous soils that formed in alluvium, colluvium, and residuum derived from quartzite and related rock

Areas of this map unit are throughout the survey area. This unit is characterized by dissected drainageways, small perennial and intermittent streams, and some areas of Rock outcrop. Slopes are 5 to 65 percent. Elevation ranges from 5,000 to 7,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 39 to 43 degrees F, and the average frost-free season is 60 to 90 days.

This unit makes up about 22 percent of the survey area. It is about 25 percent Camelback and similar soils, 15 percent Hades and similar soils, and 15 percent Valmar and similar soils. The remaining 45 percent is components of minor extent.

Camelback soils are on side slopes of mountains and foothills. These soils are deep and very deep. They formed in alluvium and colluvium derived dominantly from quartzite and related rock. The surface layer is gravelly silt loam. The subsoil is extremely cobbly silt loam. Quartzite is at a depth of 42 inches. Unweathered bedrock is at a depth of 40 to 60 inches.

Hades soils are on foot slopes and in concave areas on side slopes of mountains and foothills. These soils are very deep. They formed in alluvium derived dominantly from quartzite and related rock. The surface layer is gravelly silt loam. The subsoil is gravelly silt loam and gravelly silty clay loam to a depth of 60 inches.

Valmar soils are on ridges and convex side slopes of foothills and mountains. These soils are moderately deep. They formed in alluvium, colluvium, and residuum derived dominantly from quartzite and related rock. The surface layer is very cobbly silt loam. The subsoil is very cobbly silt loam and extremely stony silt loam. Quartzite is at a depth of 24 inches. Bedrock is at a depth of 20 to 40 inches.

Of minor extent in this unit are the very deep Lanoak, Moonlight, Greys, Broadhead, Yago, Pavohroo, Cedarhill, Holmes, and Coalbank soils; the moderately deep Trailcreek and Lonigan soils; the shallow Swanner soils; and the somewhat poorly drained Enochville and Enochville Variant soils. The Lanoak soils are on loess-covered side slopes and foot slopes of mountains and foothills. The Moonlight and Pavohroo soils are on concave, north- and east-facing side slopes. The Greys soils are on loess-covered, concave, north- and east-facing side slopes. The Broadhead and Yago soils are on foot slopes and fan terraces. The calcareous Cedarhill soils are associated with limestone outcrops. The Holmes, Enochville, and Enochville Variant soils are on stream terraces. The Coalbank, Trailcreek, and Lonigan soils are associated with volcanic ash outcrops. The Swanner soils are associated with andesite outcrops west of the City of Pocatello.

Most areas of this unit are used for livestock grazing, rangeland wildlife habitat, and watershed. A few areas are used for homesite and recreational development.

This unit is well suited to livestock grazing and rangeland wildlife habitat. The natural vegetation produced by the soils in this unit provide food and cover for mule deer, sage grouse, sharp-tailed grouse, meadowlark, jackrabbit, and coyote.

The main limitations of this unit for homesite and recreational development are slope, stones, and depth to bedrock. The main limitations for local roads and streets are slope, the hazard of frost action, and stones.

7. Cedarhill-Ireland

Very deep and moderately deep, well drained, calcareous soils that formed in alluvium, colluvium, and residuum derived from limestone, dolomite, and related rock

Areas of this map unit are throughout the survey area. This unit is characterized by dissected drainageways, small perennial and intermittent streams, and some areas of Rock outcrop. Slopes are 12 to 60 percent. Elevation ranges from 5,000 to 7,000 feet. The average annual precipitation is 13 to 18 inches, the average annual air temperature is 41 to 45 degrees F, and the average frost-free season is 70 to 100 days.

This unit makes up about 18 percent of the survey area. It is about 40 percent Cedarhill and similar soils and 15 percent Ireland and similar soils. The remaining 45 percent is components of minor extent.

Cedarhill soils are on side slopes of mountains and foothills. These soils are very deep. They formed in alluvium and colluvium derived dominantly from limestone and related rock. The surface layer is very cobbly silt loam. Below this to a depth of 60 inches or more are very cobbly silt loam and very cobbly loam.

Ireland soils are on ridges and convex side slopes of mountains and foothills. These soils are moderately deep. The soils formed in alluvium, colluvium, and residuum derived dominantly from dolomite, limestone, and related rock. The surface layer is extremely stony silt loam. The subsoil is very stony silt loam and extremely stony silt loam. Interbedded dolomite and limestone are at a depth of 30 inches. Depth to bedrock is 20 to 40 inches.

Of minor extent in this unit are very deep Ricrest, Hondoho, Coalbank, Moonlight, Arbone, and Hades soils; deep Camelback soils; and moderately deep Ridgecrest, Lonigan, and Trailcreek soils. The Ricrest, Hondoho, and Arbone soils are on foot slopes and in concave areas on side slopes of mountains and foothills. The Coalbank, Lonigan, and Trailcreek soils are associated with volcanic ash outcrops. The Moonlight soils are on concave, north- and east-facing side slopes. The Hades and Camelback soils are on north- and east-facing side slopes and are associated with quartzite. The Ridgecrest soils are on ridges and convex side slopes.

Most areas of this unit are used for livestock grazing, rangeland wildlife habitat, and watershed. A few areas are used for homesite and recreational development.

This unit is well suited to livestock grazing and rangeland wildlife habitat. The natural vegetation produced by the soils in this unit provides food and cover for mule deer, sage grouse, sharp-tailed grouse, meadowlark, Hungarian partridge, jackrabbit, and coyote.

The main limitations of this unit for homesite and recreational development are slope, stones, and depth to bedrock. The main limitations for local roads and streets are slope and stones.

8. Sedgway-Pavohroo-Harkness

Very deep, well drained, cold soils that formed in alluvium and colluvium derived from sedimentary and metasedimentary rock and in alluvium derived from loess

Areas of this map unit are in the west-central, northeastern, and east-central parts of the survey area. This unit is characterized by dissected drainageways, small perennial and intermittent streams, and some areas of Rock outcrop. Slopes are 8 to 60 percent. Elevation ranges from 5,500 to 9,100 feet. The average annual precipitation is 22 to 30 inches, the average annual air temperature is 36 to 41 degrees F, and the average frost-free season is less than 50 days.

This unit makes up about 12 percent of the survey area. It is about 25 percent Sedgway and similar soils, 25 percent Pavohroo and similar soils, and 20 percent Harkness and similar soils. The remaining 30 percent is components of minor extent.

Sedgway soils are on side slopes of mountains. They formed in alluvium and colluvium derived dominantly from sedimentary and metasedimentary rock. The surface layer is gravelly silt loam in the upper part and very cobbly silt loam in the lower part. The subsurface layer is very cobbly loam. The subsoil is very cobbly clay loam to a depth of 60 inches or more.

Pavohroo soils are on concave side slopes and on foot slopes of mountains. They formed in alluvium and colluvium derived from sedimentary and metasedimentary rock and in alluvium derived from loess. The surface layer is silt loam. The subsoil is stony loam to a depth of 60 inches or more.

Harkness soils are on mountainsides. They formed in mixed alluvium derived from a variety of sedimentary and metasedimentary rock, dominantly sandstone and quartzite. The surface layer is silt loam. The subsurface layer is very cobbly loam. The subsoil is silty clay loam to a depth of 60 inches or more.

Of minor extent in this unit are very deep Greys, Toponce, Mikesell, Beaverdam, Scout Variant, Moonlight, Broadhead, and Camelback Variant soils; deep Camelback soils; moderately deep Dateman, Ireland, Valmar, and Valmar Variant soils; and somewhat poorly drained Enochville and Enochville Variant soils. The Greys and Toponce soils are on foot slopes of mountains. The Mikesell and Beaverdam soils are on side slopes and foot slopes of mountains. The Scout Variant soils are in concave areas on the upper part of mountainsides. The Broadhead soils are on south-facing foot slopes. The Camelback Variant and Valmar Variant soils are on mountaintops and on the higher ridges. The Moonlight soils are in concave areas on the lower part of mountainsides. The Dateman soils are on convex, north-facing mountainsides. The Ireland, Camelback, and Valmar soils are on south-facing mountainsides. The Enochville and Enochville Variant soils are on stream terraces.

Most areas of this unit are used for timber production, livestock grazing, woodland wildlife habitat, and watershed. A few areas are used for homesite and recreational development.

The main limitations of this unit for producing and harvesting timber are slope, the hazard of water erosion, and the hazard of plant competition. The main limitation for livestock grazing is the limited amount of forage produced when the tree canopy closes.

The natural vegetation produced by the soils in this unit provides food and cover for mule deer, elk, bear, ruffed grouse, blue grouse, owls, woodpeckers, and squirrels.

The main limitations of this unit for homesite development are slope, stones, a slow water intake rate, and shrink-swell potential. The main limitations for recreational development are slope, the hazard of water erosion, and a slow water intake rate. The main limitations for local roads and streets are slope, shrink-swell potential, low soil strength, and frost action potential.

Detailed Soil Map Units

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

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

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavior divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

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

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Rexburg silt loam, 1 to 4 percent slopes, is one of several phases in the Rexburg series.

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Ririe-Watercanyon complex, 4 to 12 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary

to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Toponce-Broadhead association, 6 to 30 percent slopes, is an example.

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

This survey was mapped at two levels of detail. At the most detailed level, map units are narrowly defined. This means that map unit boundaries were plotted and verified at closely spaced intervals. At the less detailed level, map units are broadly defined. Boundaries were plotted and verified at wider intervals. The broadly defined units are indicated by an asterisk in the map legend. The detail of mapping was selected to meet the anticipated long-term use of the survey, and the map units were designed to meet the needs for that use.

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

In the map units that follow, the hazard of soil blowing is given only for those soils that are in areas subject to high wind velocities.

Map Unit Descriptions

1—Arbone silt loam, 1 to 4 percent slopes. This very deep, well drained soil is on stream terraces and fan terraces. It formed in alluvium derived from mixed sources. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,700 to 5,700 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is grayish brown silt loam 9 inches thick. The subsoil is brown and pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown, calcareous silt loam.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Arbone gravelly silt loam in slightly convex areas, about 5 percent is Hondoho gravelly silt loam in convex areas and near terrace breaks, and about 5 percent is Watercanyon silt loam in eroded areas. The remaining 5 percent is small areas of Hondoho cobbly silt loam, Ririe silt loam, Arimo silt loam, and soils that have slopes of more than 4 percent.

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

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

This unit is well suited to nonirrigated crops. It is used primarily for the production of wheat, barley, and a small amount of alfalfa hay. It is limited mainly by low rainfall. Because precipitation is marginal for annual cropping, the cropping system usually includes small grain and summer fallow. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are performed on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass.

This unit is well suited to irrigated crops. It is used primarily for the production of wheat, barley, and alfalfa hay. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion.

This unit is well suited to use as rangeland. It has few limitations. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The suitability of the unit for rangeland seeding is good.

This map unit is in capability subclasses IIIe, irrigated, and IIIc, nonirrigated.

2—Arbone silt loam, 4 to 12 percent slopes. This very deep, well drained soil is on stream terraces and fan terraces. It formed in alluvium derived from mixed sources. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,700 to 5,700 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is grayish brown silt loam 9 inches thick. The subsoil is brown and pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown, calcareous silt loam.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Arbone gravelly silt loam in slightly convex areas and near terrace breaks and about 10 percent is Hondoho cobbly silt loam in convex areas and near terrace breaks. The

remaining 5 percent is small areas of Hondoho gravelly silt loam, Watercanyon silt loam, Ririe silt loam, Arimo silt loam, and soils that have slopes of less than 4 percent or more than 12 percent.

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

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

This unit is suited to nonirrigated crops. It is used primarily for the production of wheat, barley, and a small amount of alfalfa hay. It is limited mainly by low rainfall and the hazard of water erosion. Because precipitation is marginal for annual cropping, the cropping system usually includes small grain and summer fallow. Practices that can be used to control erosion include seeding early in fall, stubble mulch tillage, and construction of terraces, diversions, and grassed waterways. Special designs for terraces and diversions are needed because of the shallow depth to moderately alkaline and strongly alkaline soil material. Bringing this material to the surface reduces the production of crops. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The suitability of this unit for rangeland seeding is good.

This map unit is in capability subclass IIIe.

3—Arbone-Hondoho complex, 12 to 20 percent slopes. This map unit is on mountain foot slopes and dissected fan terraces. The native vegetation is mainly shrubs and grasses. Elevation is about 4,700 to 5,700 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

This unit is about 55 percent Arbone gravelly silt loam and 30 percent Hondoho gravelly silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Hondoho cobbly silt loam on south-facing side slopes and near the bottoms of drainageways and about 5 percent is soils that are similar to the Arbone and Hondoho soils but have slopes of more than 20 percent. The remaining 5 percent is small areas of Watercanyon silt loam and very deep soils in drainageways.

The Arbone soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown gravelly silt loam 9 inches thick. The subsoil is brown and pale brown, calcareous gravelly silt loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown, calcareous gravelly silt loam.

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

The Hondoho soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown gravelly silt loam 8 inches thick. The subsoil is brown, calcareous gravelly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very gravelly silt loam.

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

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. This unit is suited to range seeding. Use of mechanical equipment such as rangeland plows and drills is limited by the very high hazard of erosion. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass IVe.

4—Arbone-McCarey-Lava flows complex, 4 to 12 percent slopes. This map unit is on the Portneuf Basalt Flow and the stream terraces created by the Bonneville Flood. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,600 to 4,800 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

This unit is about 40 percent Arbone silt loam, 20 percent McCarey silt loam, and 15 percent Lava flows. The Arbone soil is in channeled areas between areas of Lava flows. The McCarey soil is adjacent to the Lava flows and commonly separates the Lava flows from the Arbone soil. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is McCarey Variant extremely stony silt loam adjacent to Lava flows, about 5 percent is Arimo silt loam, and about 5 percent is Downey gravelly silt loam. Arimo and Downey soils are in pockets and on long, rounded terraces. The remaining 10 percent is small areas of Hondoho gravelly silt loam, Holmes gravelly loam, Manila silt loam, and soils that

have slopes of less than 4 percent or more than 12 percent.

The Arbone soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown silt loam 9 inches thick. The subsoil is brown and pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown, calcareous silt loam.

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

The McCarey soil is moderately deep and well drained. It formed in loess and silty alluvium and in material weathered from basalt. Typically, the surface layer is dark grayish brown and grayish brown silt loam 12 inches thick. The subsoil is brown silt loam 5 inches thick. The substratum is light gray, calcareous silt loam 11 inches thick over basalt. Depth to bedrock ranges from 20 to 40 inches.

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

Lava flows consists of exposed basalt that is highly fractured and has many crevices. The vegetation is mostly moss and lichens. The material in some crevices supports serviceberry, mountain big sagebrush, Rocky Mountain maple, currant, and antelope bitterbrush.

This unit is used as irrigated cropland and pastureland, nonirrigated cropland, and rangeland.

This unit is suited to irrigated crops and pasture. Wheat, barley, and alfalfa hay are the main crops grown. The unit is limited mainly by the very high hazard of erosion and the areas of Lava flows. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Erosion can be reduced and fertility maintained by using a suitable cropping system, crop residue management, minimum tillage, and proper fertilization.

This unit is suited to nonirrigated crops. It is used for the production of wheat, barley, and a very small amount of alfalfa hay. It is limited mainly by low precipitation, the high hazard of water erosion, and the areas of Lava flows. Because precipitation is marginal for annual cropping, the cropping system usually includes small grain and summer fallow. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are performed on the contour or across the slope.

Chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is suited to use as rangeland. The main limitation is areas of Lava flows. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The Arbone and McCarey soils are suited to the use of mechanical equipment such as rangeland plows and drills. These soils are suited to rangeland seeding.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

5—Arbone-Rubble land complex, 2 to 8 percent slopes. This map unit is on stream terraces adjacent to the Portneuf Basalt Flow. The native vegetation is mainly shrubs and grasses. Elevation is about 4,500 to 4,700 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

This unit is about 50 percent Arbone silt loam and 30 percent Rubble land. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 10 percent is Rexburg silt loam in concave areas and about 5 percent is Hondoho cobbly silt loam in slightly convex areas. The remaining 5 percent is small areas of Arimo silt loam, McCarey silt loam, and soils and Rubble land that have slopes of more than 8 percent.

The Arbone soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown silt loam 9 inches thick. The subsoil is brown and pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown, calcareous silt loam.

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

Rubble land consists mainly of areas of stones and boulders primarily deposited by the Bonneville Flood. Rubble land supports little vegetation except for mosses and lichens and a few stunted shrubs or trees growing between the rock fragments. The stones and boulders are subangular to subrounded and are 1 foot to 20 feet in diameter. Areas of Rubble land are not suitable for most land uses.

This unit is used as rangeland.

This unit is suited to use as rangeland. It is limited mainly by the areas of Rubble land. The potential natural

plant community on the Arbone soil is mainly mountain big sagebrush and bluebunch wheatgrass. This soil has few limitations for use as rangeland. It is well suited to the use of mechanical equipment such as rangeland plows and drills.

This map unit is in capability subclass VIs.

6—Arimo silt loam, 0 to 3 percent slopes. This very deep, well drained soil is on terraces. It formed in loess and silty alluvium overlying alluvial sand and gravel of mixed mineralogy. The soil is moderately deep to sand and gravel. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,600 to 4,900 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 95 days.

Typically, the surface layer is grayish brown silt loam 6 inches thick. The subsoil is brown silt loam 12 inches thick. The upper 15 inches of the substratum is white, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored, calcareous extremely gravelly coarse sand. Depth to extremely gravelly coarse sand ranges from 20 to 40 inches.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 10 percent is Downey gravelly silt loam near terrace breaks and drainageway side slopes and about 5 percent is soils that have slopes of slightly more than 3 percent.

Permeability of this Arimo soil is moderate to a depth of 33 inches and very rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. In both irrigated and nonirrigated areas, runoff is slow and the hazard of water erosion is slight.

Most areas of this unit are used as irrigated cropland. A few areas are used as rangeland, for homesite development, or as nonirrigated cropland.

This unit is well suited to irrigated crops. It is used mainly for the production of wheat, barley, and alfalfa hay. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs. Returning crop residue to the soil or regularly adding other organic matter improves fertility, reduces crusting, and increases the water intake rate.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush and bluebunch wheatgrass. The suitability of this unit for rangeland seeding is good.

If this unit is used for homesite development, the main limitations are the hazard of cutbanks caving in and seepage in the lower part of the soil and the hazard of frost action in the upper part. If the density of housing is moderate to high, community sewage systems help to prevent contamination of ground water as a result of seepage from onsite sewage disposal systems. Cutbanks are not stable and are subject to slumping. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks.

If this unit is used as nonirrigated cropland, the main limitations are low precipitation and the restricted available water capacity. Because precipitation is marginal for annual cropping, the cropping system usually includes small grain and summer fallow. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This map unit is in capability subclass IIIs, irrigated and nonirrigated.

7—Bahem silt loam, 0 to 2 percent slopes. This very deep, well drained soil is on terraces. It formed in silty alluvium overlying flood-deposited sand, gravel, cobbles, and stones of mixed mineralogy. Elevation is about 4,400 to 4,500 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is pale brown, calcareous silt loam 11 inches thick. The upper 38 inches of the underlying material is pale brown, white, and light gray, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored extremely cobbly sand. Depth to extremely cobbly sand ranges from 40 to 60 inches.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 10 percent is Broxon silt loam on terraces. The remaining 5 percent is small areas of Broncho cobbly loam, soils that are similar to this Bahem soil but have a weakly cemented pan at a depth of 25 to 35 inches, and soils that have slopes of more than 2 percent.

Permeability of this Bahem soil is moderate to a depth of 49 inches and very rapid below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. In both irrigated and nonirrigated areas, runoff is slow and the hazard of water erosion is slight. The hazard of soil blowing is slight.

Most areas of this unit are used as irrigated cropland and pasture. A few areas are used for homesite development.

This unit is well suited to irrigated crops. It is used for the production of wheat, barley, potatoes, and alfalfa hay. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Maintaining crop residue on or near the surface reduces

runoff and helps to maintain soil tilth and organic matter content.

The soil in this unit is very susceptible to the formation of a tillage pan and other compacted layers. The tillage pan and other compacted layers reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers and helps to prevent them from forming.

This unit is well suited to use as irrigated pasture. Irrigation water can be applied by the border, corrugation, or sprinkler methods.

Population growth has resulted in increased construction of homes on this unit. The main limitations for homesite development are the hazard of frost action and moderate permeability in the upper part of the soil and the hazard of cutbanks caving in and seepage in the lower part. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. If the density of housing is moderate to high, community sewage systems help to prevent contamination of ground water by seepage from onsite sewage disposal systems. Cutbanks are not stable and are subject to slumping.

This map unit is in capability subclasses IIc, irrigated, and VIc, nonirrigated.

8—Bahem silt loam, 2 to 4 percent slopes. This very deep, well drained soil is on terraces. It formed in silty alluvium overlying flood-deposited sand, gravel, cobbles, and stones of mixed mineralogy. Elevation is about 4,400 to 4,500 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is pale brown, calcareous silt loam 11 inches thick. The upper 38 inches of the underlying material is pale brown, white, and light gray, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored extremely cobbly sand. Depth to extremely cobbly sand ranges from 40 to 60 inches.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 10 percent is Broxon silt loam on terraces. The remaining 5 percent is small areas of Broncho cobbly loam, soils that are similar to this Bahem soil but have a weakly cemented pan at a depth of 25 to 35 inches, and soils that have slopes of more than 4 percent.

Permeability of this Bahem soil is moderate to a depth of 49 inches and very rapid below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. If this soil is irrigated, runoff is medium and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Most areas of this unit are used as irrigated cropland and pasture. A few areas are used for homesite development.

This unit is well suited to irrigated crops. It is used for the production of wheat, barley, potatoes, and alfalfa hay. It is limited mainly by the moderate hazard of erosion. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content.

The soil in this unit is very susceptible to the formation of a tillage pan and other compacted layers. The tillage pan and other compacted layers reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as irrigated pasture. Irrigation water can be applied by the border, corrugation, or sprinkler methods.

Population growth has resulted in increased construction of homes on this unit. The main limitations for homesite development are the hazard of frost action and moderate permeability in the upper part of the soil and the hazard of cutbanks caving in and seepage in the lower part. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. If the density of housing is moderate to high, community sewage systems help to prevent the contamination of ground water by seepage from onsite sewage disposal systems. Cutbanks are not stable and are subject to slumping.

This map unit is in capability subclasses IIe, irrigated, and VIc, nonirrigated.

9—Bancroft silt loam, 4 to 12 percent slopes. This very deep, well drained soil is on fan terraces, foothills, and mountain foot slopes. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is brown silt loam 7 inches thick. The upper 30 inches of the subsoil is brown and yellowish brown silty clay loam, and the lower 4 inches is light yellowish brown, calcareous silt loam. The substratum to a depth of 60 inches or more is very pale brown and pale brown, calcareous silt loam.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Ricrest gravelly silt loam on south- and west-facing side slopes, about 5 percent is Hades gravelly silt loam on north- and

east-facing concave side slopes, and about 10 percent is Watercanyon silt loam on eroded and convex ridges. The remaining 5 percent is small areas of Cedarhill cobbly silt loam, Lanoak silt loam, and soils that have slopes of less than 4 percent or more than 12 percent.

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

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

This unit is suited to nonirrigated crops. It is limited mainly by susceptibility to erosion. Erosion can be reduced and fertility maintained by using a suitable cropping system, crop residue management, minimum tillage, and proper fertilization. Practices that can be used to control erosion include seeding early in fall, stubble mulch tillage, and construction of terraces, diversions, and grassed waterways. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush, bluebunch wheatgrass, and arrowleaf balsamroot. The suitability of this unit for rangeland seeding is good.

This map unit is in capability subclass IIIe.

10—Bancroft silt loam, 12 to 20 percent slopes. This very deep, well drained soil is on mountainsides, foothills, and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is brown silt loam 7 inches thick. The upper 30 inches of the subsoil is brown and yellowish brown silty clay loam, and the lower 4 inches is light yellowish brown, calcareous silt loam. The substratum to a depth of 60 inches or more is very pale brown and pale brown, calcareous silt loam.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Watercanyon silt loam on convex ridges and south-facing, convex side slopes, about 5 percent is Hades gravelly silt loam on north-facing, slightly concave side slopes, and about 5 percent is Cedarhill very cobbly silt loam, high precipitation, on south-facing, convex side slopes. The remaining 5 percent is small areas of Manila silt loam, Lanoak silt loam, Coalbank very fine sandy loam, Trailcreek very fine sandy loam, Hondoho cobbly silt loam, and soils that have slopes of less than 12 percent or more than 20 percent.

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

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

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. It is limited mainly by the very high hazard of water erosion. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are performed on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to use as rangeland. The potential natural plant community is mainly bluebunch wheatgrass, mountain big sagebrush, and arrowleaf balsamroot. This unit is suited to the use of mechanical equipment such as rangeland plows and drills. The main limitation is the very high hazard of water erosion if the vegetation is removed and the soil surface is disturbed. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass IVe.

11—Bancroft-Manila complex, 15 to 30 percent slopes. This map unit is on fan terraces and mountain foot slopes. The native vegetation is mainly shrubs and grasses. Elevation is about 5,000 to 6,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 75 days.

This unit is about 45 percent Bancroft silt loam and about 30 percent Manila silt loam. The Bancroft soil is on nearly plane to slightly convex side slopes, and the Manila soil is on nearly plane to slightly concave side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Joes silt loam on eroded, south-facing side slopes and ridgetops, about 5 percent is Cedarhill very gravelly silt loam, and about 5 percent is Yago extremely stony silty clay loam on ridgetops and convex side slopes. The remaining 5 percent is small areas of Broadhead silt loam, Trailcreek very fine sandy loam, and soils that have slopes of less than 15 percent or more than 30 percent.

The Bancroft soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is brown silt loam 7 inches thick. The upper 30 inches of the subsoil is brown and yellowish brown silty clay loam, and the lower 4 inches is light yellowish brown, calcareous silt loam. The substratum to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

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

The Manila soil is very deep and well drained. It formed in alluvium derived from sedimentary and metasedimentary rock and loess. Typically, the upper 7 inches of the surface layer is grayish brown silt loam and the lower 8 inches is grayish brown silty clay loam. The subsoil is yellowish brown and dark brown silty clay and silty clay loam 33 inches thick. The substratum to a depth of 60 inches or more is pale brown and light yellowish brown, calcareous silt loam.

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

This unit is used as nonirrigated cropland and rangeland.

This unit is suited to nonirrigated crops. It is limited mainly by the very high hazard of water erosion and the frost-free period. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are performed on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the growing season is shorter than normal, which significantly reduces yields of crops on this unit. Seeding to permanent cover may be needed to reduce erosion.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Mechanical equipment such as rangeland plows and drills is suitable for use in areas where slopes are 20 percent or less, but its use is limited in areas where slopes are more than 20 percent because of the very high hazard of erosion. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass VIe.

12—Banida silty clay loam, 0 to 2 percent slopes. This very deep, moderately well drained soil is on lake terraces. It formed in lake sediment and in alluvium derived from lake sediment. Elevation is about 4,750 to 5,150 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 95 days.

Typically, the upper 6 inches of the surface layer is brown silty clay loam and the lower 3 inches is brown silty clay. The upper 13 inches of the subsoil is reddish brown silty clay, and the lower 18 inches is reddish brown and light brown, calcareous silty clay. The substratum to a depth of 60 inches or more is light brown, calcareous silty clay.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 15 percent is a soil that is similar to this Banida soil but has a silt loam surface layer and is on concave side slopes and in drainageways and about 5 percent is Oxford silty clay loam on the higher convex side slopes and ridges. The remaining 5 percent is small areas of Hondoho cobbly silt loam and soils that are strongly saline or very strongly saline. These included saline soils are near the southern boundary of the survey area, south of Swan Lake.

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

This unit is used as nonirrigated cropland.

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The main limitation is the high clay content of the surface layer. The soil in this unit is difficult to till when it is dry and is subject to clodding and compaction if it is tilled when too wet. The period during which the soil moisture content is most suitable for tillage is short. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration.

This map unit is in capability subclass IIIs.

13—Bear Lake-Bear Lake Variant complex, drained, 0 to 1 percent slopes. This map unit is on flood plains and low terraces. Drainage of this unit has been altered by the natural downcutting of the Portneuf River. The native vegetation is mainly sedges and grasses. Elevation is about 5,100 to 5,200 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 85 days.

This unit is about 50 percent Bear Lake silt loam and about 30 percent Bear Lake Variant silt loam. The components of this unit are so intricately intermingled

that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Inkom silt loam along the edges of the bottom lands and about 5 percent is soils that are similar to the Bear Lake and Bear Lake Variant soils but are very poorly drained. The remaining 10 percent is small areas of tufa outcrops, soils that are similar to the Bear Lake Variant soil but are less than 20 inches deep to tufa, Joevar silt loam, soils that are similar to the Bear Lake and Bear Lake Variant soils but that have a sandy loam subsoil, and soils that have slopes of slightly more than 1 percent.

The Bear Lake soil is very deep and poorly drained. It formed in silty alluvium derived from mixed sources. Typically, the surface layer is dark grayish brown, calcareous silt loam 12 inches thick. The subsoil is light gray, calcareous silty clay loam 12 inches thick. The upper 16 inches of the substratum is light gray, calcareous silty clay loam, and the lower part to a depth of 60 inches or more is light gray, calcareous silt loam.

Permeability of the Bear Lake soil is moderately slow. Available water capacity is high. Effective rooting depth for non-water-tolerant plants is limited by a seasonal high water table that is at a depth of 0 to 1.5 feet from January through June. Runoff is very slow, and the hazard of water erosion is slight. This soil is frequently flooded for brief periods from January through June.

The Bear Lake Variant soil is moderately deep and poorly drained. It formed in silty alluvium derived from mixed sources. Typically, the surface layer is very dark gray, calcareous silt loam 5 inches thick. The upper 4 inches of the subsoil is very dark gray, calcareous silt loam, and the lower 8 inches is dark gray, calcareous silt loam. The substratum is gray, light olive gray, and dark gray, calcareous silt loam 19 inches thick over tufa. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Bear Lake Variant soil is moderately slow. Available water capacity is moderate. Effective rooting depth for non-water-tolerant plants is limited by a seasonal high water table that is at a depth of 0 to 1.5 feet from January through June, and for all plants it is limited by bedrock at a depth of 20 to 40 inches. Runoff is very slow, and the hazard of water erosion is slight. This soil is frequently flooded for brief periods from January through June.

This unit is used for the production of meadow hay and pasture.

This unit is suited to hay and pasture. The potential natural plant community on the unit is mainly tufted hairgrass and Nebraska sedge and other sedges. The main limitation is wetness. Wetness limits the choice of plants and the period of harvesting or grazing and increases the risk of winterkill. Plants that tolerate wetness should be seeded. Grazing and harvesting of hay should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock and support the weight of harvesting equipment. This unit is capable of producing about 2 tons of grass hay per acre if nonirrigated and about 2.5 tons if irrigated.

This map unit is in capability subclass Vw, irrigated and nonirrigated.

14—Broadhead-Hades-Yago complex, 4 to 20 percent slopes. This map unit is on mountainsides and fan terraces. The native vegetation is mainly shrubs and grasses. Elevation is about 6,000 to 7,000 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period is about 65 days.

This unit is about 30 percent Broadhead silt loam, about 25 percent Hades gravelly silt loam, and about 25 percent Yago extremely stony silty clay loam. The Broadhead soil generally is on south- and west-facing side slopes. The Hades and Yago soils are on the same landforms as the Broadhead soils, but they have a mound and intermound relationship. The Hades soil is on the mounds, and the Yago soil is in the intermound areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is very deep, poorly drained and somewhat poorly drained soils along drainageways. The remaining 15 percent is small areas of Sedgway gravelly silt loam, Harkness silt loam, Toponce silt loam, Camelback very cobbly silt loam, and soils that have slopes of less than 4 percent or more than 20 percent.

The Broadhead soil is very deep and well drained. It formed in mixed alluvium derived dominantly from sandstone and quartzite. The upper 2 inches of the surface layer is very dark grayish brown silt loam, and the lower 7 inches is very dark grayish brown silty clay loam. The subsoil to a depth of 60 inches or more is dark grayish brown and brown silty clay loam.

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

The Hades soil is very deep and well drained. It formed in mixed alluvium derived dominantly from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

The Yago soil is very deep and well drained. It formed in mixed alluvium and colluvium derived dominantly from sandstone and quartzite. Typically, the surface layer is dark grayish brown extremely stony silty clay loam 10 inches thick. The upper 27 inches of the subsoil is brown very stony clay loam, and the lower 8 inches is light brown, calcareous very stony clay loam. The substratum to a depth of 60 inches or more is reddish yellow, calcareous very stony silty clay loam.

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

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of mechanical equipment such as rangeland drills and plows is not practical on the Yago soil because the surface is extremely stony. Livestock and wildlife concentrate in the included areas of poorly drained and somewhat poorly drained soils within this unit. These areas provide access to water and shade, and they produce the more palatable vegetation when not overused. If economically feasible, these areas should be managed using a deferred grazing system. It is likely that many of these areas will be considered sacrifice areas when developing an overall grazing plan.

This map unit is in capability subclass VIe.

15—Broadhead-Yago complex, 4 to 12 percent slopes. This map unit is on mountain foot slopes and fan terraces. The native vegetation is mainly shrubs and grasses. Elevation is about 6,000 to 6,500 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days.

This unit is about 60 percent Broadhead silt loam and about 20 percent Yago extremely stony silty clay loam. The Broadhead soil is generally on south- and west-facing, concave to slightly convex foot slopes and fan terraces. The Yago soil is generally on south- and west-facing, convex foot slopes and fan terraces. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Toponce silt loam on concave, north- and east-facing side slopes and about 5 percent is soils that have a high shrink-swell potential in the surface layer and are on the same kind of landscape positions as the Yago soil. The remaining 10 percent is small areas of very deep, poorly drained and somewhat poorly drained soils, Camelback very cobbly silt loam, Hades gravelly silt loam, and soils that have slopes of more than 12 percent.

The Broadhead soil is very deep and well drained. It formed in mixed alluvium derived dominantly from sandstone and quartzite. Typically, the upper 2 inches of the surface layer is very dark grayish brown silt loam and the lower 7 inches is very dark grayish brown silty clay loam. The subsoil to a depth of 60 inches or more is dark grayish brown and brown silty clay loam.

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

The Yago soil is very deep and well drained. It formed in mixed alluvium and colluvium derived dominantly from sandstone and quartzite. Typically, the surface layer is dark grayish brown extremely stony silty clay loam 10 inches thick. The upper 27 inches of the subsoil is brown very stony clay loam, and the lower 8 inches is light brown, calcareous very stony clay loam. The substratum to a depth of 60 inches or more is reddish yellow, calcareous very stony silty clay loam.

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

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

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of mechanical equipment such as rangeland plows and drills is not practical on the Yago soil because the surface is extremely stony.

This unit is suited to hay and pasture. The main limitations are the extremely stony surface of the Yago soil and the hazard of water erosion. Stones on the surface of the Yago soil affect the use of most equipment. If this unit is irrigated, sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

16—Broadhead-Yago complex, 12 to 20 percent slopes. This map unit is on mountain foot slopes and fan terraces. The native vegetation is mainly shrubs and grasses. Elevation is about 5,500 to 6,500 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days.

This unit is about 40 percent Broadhead silt loam and about 35 percent Yago extremely stony silty clay loam. The Broadhead soil is generally on slightly concave foot slopes and fan terraces. The Yago soil is generally on convex foot slopes and fan terraces. The Yago soil generally has a more southerly or westerly aspect than the Broadhead soil. The components of this unit are so

intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Hades gravelly silt loam on slightly concave, north- and east-facing side slopes, about 5 percent is Camelback very cobbly silt loam on slightly convex, north- and east-facing side slopes, and about 5 percent is soils that have a high shrink-swell potential in the surface layer and are on the same kind of landscape positions as the Yago soil. The remaining 10 percent is small areas of Cedarhill very cobbly silt loam, soils that are underlain by and contain volcanic ash, Bancroft silt loam, Toponce silt loam, and soils that have slopes of less than 12 percent or more than 20 percent.

The Broadhead soil is very deep and well drained. It formed in mixed alluvium derived dominantly from sandstone and quartzite. Typically, the upper 2 inches of the surface layer is very dark grayish brown silt loam and the lower 7 inches is very dark grayish brown silty clay loam. The subsoil to a depth of 60 inches or more is dark grayish brown and brown silty clay loam.

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

The Yago soil is very deep and well drained. It formed in mixed alluvium and colluvium derived dominantly from sandstone and quartzite. Typically, the surface layer is dark grayish brown extremely stony silty clay loam 10 inches thick. The upper 27 inches of the subsoil is brown very stony clay loam, and the lower 8 inches is light brown, calcareous very stony clay loam. The substratum to a depth of 60 inches or more is reddish yellow, calcareous very stony silty clay loam.

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

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. Use of mechanical equipment such as rangeland plows and drills is not practical on the Yago soil because the surface is extremely stony.

This map unit is in capability subclass IVe.

17—Broncho cobbly loam, 1 to 8 percent slopes. This very deep, somewhat excessively drained soil is on terraces. It formed in alluvium that was deposited mainly by the ancient Bonneville Flood. Elevation is about 4,400 to 4,500 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is pale brown cobbly loam 6 inches thick. The subsoil is very pale brown, calcareous cobbly loam 7 inches thick. The substratum to a depth of 60 inches or more is multicolored, calcareous extremely cobbly coarse sand.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Bahem silt loam on the outer edges of the unit, about 5 percent is Broxon silt loam near the boundaries of the unit, and about 5 percent is soils that are similar to this Broncho soil but are very gravelly loam throughout the profile.

Permeability of this Broncho soil is moderate to a depth of 13 inches and very rapid below this depth. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used mainly for irrigated hay, pasture, and crops. It is also used for homesite development.

This unit is suited to irrigated hay and pasture. The main limitations are cobbles and gravel on the surface and low available water capacity. Because the soil in this unit is droughty, applications of irrigation water should be light and frequent. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion.

This unit is suited to irrigated crops. It is used for the production of wheat, barley, and potatoes. The main limitations are the shape and size of areas of the unit, cobbles and gravel on the surface, and low available water capacity. The long, narrow shape of areas of this unit generally dictates that they be included with adjacent soils when farmed. Because the soil is droughty, applications of irrigation water should be light and frequent. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content.

Population growth has resulted in increased construction of homes on this unit. The main limitations are seepage and the hazard of cutbanks caving in. If the density of housing is moderate to high, community sewage systems help to prevent contamination of ground water as a result of seepage from onsite sewage disposal systems. Cutbanks are not stable and are subject to slumping.

This map unit is in capability subclasses IVe, irrigated, and VIe, nonirrigated.

18—Broncho extremely stony loam, 4 to 20 percent slopes. This very deep, somewhat excessively drained soil is on terraces. It formed in alluvium deposited mainly by the ancient Bonneville Flood. The

native vegetation is mainly shrubs and grasses. Elevation is about 4,400 to 4,500 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 49 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is pale brown extremely stony loam 6 inches thick. The subsoil is very pale brown, calcareous very stony loam 7 inches thick. The substratum to a depth of 60 inches or more is multicolored, calcareous extremely stony coarse sand.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Broxon silt loam that has slopes of 0 to 2 percent and is on the outer edges of the unit, about 5 percent is Broncho cobbly loam that has slopes of less than 8 percent, and about 5 percent is a soil that is similar to this Broncho soil and is on similar landscape positions but is extremely bouldery. The remaining 5 percent is small areas of Bahem silt loam and small areas of Broncho extremely stony loam that has slopes of as much as 50 percent and is on breaks along the Portneuf River.

Permeability of this Broncho soil is moderate to a depth of 13 inches and very rapid below this depth. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high.

Most areas of this unit are used as rangeland. A few areas are used for homesite development.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, and Thurber needlegrass. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the extremely stony surface. This unit is limited for livestock watering ponds and other water impoundments by the seepage potential.

Population growth has resulted in increased construction of homes on this unit. The main limitations for homesite development are large stones, seepage, and the hazard of cutbanks caving in. The presence of stones and cobbles may hamper excavation. If the density of housing is moderate to high, community sewage systems help to prevent contamination of ground water as a result of seepage from onsite sewage disposal systems. Cutbanks are not stable and are subject to slumping.

This map unit is in capability subclass VIIs.

19—Broncho Variant-Pocatello complex, 20 to 50 percent slopes. This map unit is on fan terrace breaks and side slopes along drainageways. The native vegetation is mainly shrubs and grasses. Elevation is about 4,400 to 5,200 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 110 days.

This unit is about 45 percent Broncho Variant very gravelly loam and about 45 percent Pocatello silt loam. The Broncho Variant soil is generally on south- and west-facing side slopes, and the Pocatello soil is generally on north- and east-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is soils that have slopes of less than 20 percent or more than 50 percent. The remaining 5 percent is small areas of Rock outcrop and volcanic ash outcrops and soils that are similar to the Broncho Variant soil but are less than 40 inches deep to bedrock or have a very stony loam surface layer.

The Broncho Variant soil is very deep and well drained. It formed in alluvium derived dominantly from sedimentary and metasedimentary rock. Typically, the surface layer is pale brown, calcareous very gravelly loam 4 inches thick. The upper 24 inches of the underlying material is very pale brown and brown, calcareous extremely gravelly loam and extremely gravelly clay loam, and the lower part to a depth of 60 inches or more is yellowish brown, calcareous extremely gravelly sandy loam.

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

The Pocatello soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is grayish brown, calcareous silt loam 8 inches thick. The upper 32 inches of the underlying material is pale brown and very pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is pale brown, calcareous silt loam.

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

Most areas of this unit are used as rangeland. A few areas are used for homesite development.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, and arrowleaf balsamroot. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas.

This unit is poorly suited to homesite development. It is limited mainly by the hazard of water erosion and slope. Excavation for roads and buildings increases the risk of erosion. Slope is a concern in installing septic tank absorption fields because effluent can surface in

downslope areas and create a hazard to health. Access roads should be designed to provide adequate cut-slope grade, and drains are needed to control surface runoff and keep soil losses to a minimum.

This map unit is in capability subclass VIIe.

20—Broncho Variant-Ririe-Pocatello complex, 20 to 50 percent slopes. This map unit is on terrace breaks and side slopes along drainageways. The native vegetation is mainly shrubs and grasses. Elevation is about 4,600 to 5,200 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 46 degrees F, and the average frost-free period is about 100 days.

This unit is about 35 percent Broncho Variant very gravelly loam, about 30 percent Ririe silt loam, and about 20 percent Pocatello silt loam. The Broncho Variant and Pocatello soils are generally on the south- and west-facing side slopes, and the Ririe soil is on the north- and east-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 10 percent is Hondoho gravelly silt loam on convex, north- and east-facing side slopes. The remaining 5 percent is small areas of Rock outcrop, soils that have slopes of less than 20 percent or more than 50 percent, soils that are similar to the Broncho Variant soil but have bedrock at a depth of less than 40 inches, and Broncho extremely stony loam.

The Broncho Variant soil is very deep and well drained. It formed in alluvium derived dominantly from sedimentary and metasedimentary rock. Typically, the surface layer is pale brown, calcareous very gravelly loam 4 inches thick. The upper 24 inches of the underlying material is very pale brown and brown, calcareous extremely gravelly loam and extremely gravelly clay loam, and the lower part to a depth of 60 inches or more is yellowish brown, calcareous extremely gravelly sandy loam.

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

The Ririe soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

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

The Pocatello soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is grayish brown, calcareous silt loam 8 inches thick. The upper 32 inches of the underlying material is pale brown and very pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is pale brown, calcareous silt loam.

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

Most areas of this unit are used as rangeland. A few areas are used for homesite development.

This unit is suited to use as rangeland. The potential natural plant community on the Broncho Variant and Pocatello soils is mainly Wyoming big sagebrush, bluebunch wheatgrass, and arrowleaf balsamroot. The potential natural plant community on the Ririe soil is mainly bluebunch wheatgrass and mountain big sagebrush. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas.

This unit is poorly suited to homesite development. It is limited mainly by slope and the very high hazard of water erosion. Excavation for roads and buildings increases the risk of erosion. Slope is a concern in installing septic tank absorption fields because effluent can surface in downslope areas and create a health hazard. Access roads should be designed to provide adequate cut-slope grade, and drains are needed to control surface runoff and keep soil losses to a minimum.

This map unit is in capability subclass VIIe.

21—Broxon silt loam, 0 to 2 percent slopes. This very deep, well drained soil is on terraces. It formed in loess and silty alluvium overlying flood-deposited sand, gravel, cobbles, and stones of mixed mineralogy. Elevation is about 4,400 to 4,500 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is pale brown, calcareous silt loam 8 inches thick. The upper 17 inches of the underlying material is white and pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored extremely stony sand. Depth to extremely stony sand ranges from 20 to 40 inches.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 10 percent is Bahem silt loam on terraces. The remaining 5 percent is small areas of Broncho cobbly loam, soils that are similar to this Broxon soil but have a weakly cemented pan at a depth of 20 to 30 inches, soils that have slopes of more than 2 percent, and very poorly drained soils in low-lying areas, dominantly along the Portneuf River.

Permeability of this Broxon soil is moderate to a depth of 25 inches and very rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight in both irrigated and nonirrigated areas. The hazard of soil blowing is slight.

Most areas of this unit are used for irrigated crops and pasture. A few areas are used for homesite development.

This unit is well suited to irrigated crops. It is used for the production of wheat, barley, potatoes, and alfalfa hay. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum.

The soil in this unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as irrigated pasture. Irrigation water can be applied by the border, corrugation, or sprinkler methods.

Population growth has resulted in increased construction of homes on this unit. The main limitations for homesite development are the hazard of frost action in the silty overlying material and the hazards of cutbanks caving in and seepage in the underlying extremely stony sand. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. Cutbanks are not stable and are subject to slumping. If the density of housing is moderate to high, community sewage systems help to prevent contamination of ground water as a result of seepage from onsite sewage disposal systems.

This map unit is in capability subclasses IIc, irrigated, and VIc, nonirrigated.

22—Broxon silt loam, 2 to 4 percent slopes. This very deep, well drained soil is on terraces. It formed in loess and silty alluvium overlying flood-deposited sand, gravel, cobbles, and stones of mixed mineralogy. Elevation is about 4,400 to 4,500 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 120 days.

Typically, the surface layer is pale brown, calcareous silt loam 8 inches thick. The upper 17 inches of the underlying material is white and pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored extremely stony sand. Depth to extremely stony sand ranges from 20 to 40 inches.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 10 percent is Bahem silt loam on terraces. The remaining 5 percent is small areas of Broncho cobbly loam, soils that are similar to this Broxon soil but have a weakly cemented pan at a depth of 20 to 30 inches, and soils that have slopes of more than 4 percent.

Permeability of this Broxon soil is moderate to a depth of 25 inches and very rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. If this soil is irrigated, runoff is medium and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

Most areas of this unit are used as irrigated cropland and for pasture. A few areas are used for homesite development.

This unit is well suited to irrigated crops. It is used for the production of wheat, barley, potatoes, and alfalfa hay. It is limited mainly by the moderate hazard of erosion. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum.

The soil in this unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as irrigated pasture. It has few limitations. Irrigation water can be applied by the border, corrugation, or sprinkler methods.

Population growth has resulted in increased construction of homes on this unit. The main limitations for homesite development are the hazard of frost action in the silty overlying material and the hazards of cutbanks caving in and seepage in the underlying extremely stony sand. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. Cutbanks are not stable and are subject to slumping. If the density of housing is moderate to high, community sewage systems help to prevent contamination of ground water as a result of seepage from onsite sewage disposal systems.

This map unit is in capability subclasses IIe, irrigated, and VIc, nonirrigated.

23—Camelback-Cedarhill, high precipitation-Lanoak complex, 20 to 50 percent slopes. This map unit is on mountainsides. The native vegetation is mainly shrubs and grasses. Elevation is about 5,500 to 6,500 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42

degrees F, and the average frost-free period is about 80 days.

This unit is about 30 percent Camelback very cobbly silt loam, about 30 percent Cedarhill very cobbly silt loam, high precipitation, and about 20 percent Lanoak silt loam. The Camelback soil is dominantly on north- and east-facing, convex side slopes, the Cedarhill soil is on south- and west-facing side slopes, and the Lanoak soil is on concave, north- and east-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Valmar very cobbly silt loam on the upper part of the slopes and on ridgetops, about 5 percent is Hades gravelly silt loam on concave, north- and east-facing side slopes, and about 5 percent is Wursten gravelly silt loam on south- and west-facing side slopes. The remaining 5 percent is small areas of Pavohroo silt loam, Rock outcrop, Yago extremely stony silty clay loam, Ireland extremely stony silt loam, Moonlight silt loam, and a very deep soil along drainageways.

The Camelback soil is deep and well drained. It formed in alluvium and colluvium derived dominantly from sedimentary and metasedimentary rock. Typically, the surface layer is dark brown very cobbly silt loam 21 inches thick. The subsoil is dark brown and yellowish brown extremely cobbly silt loam 21 inches thick. Bedrock is at a depth of 42 inches. Depth to bedrock ranges from 40 to 60 inches.

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

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from sedimentary and metasedimentary rock.

Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

The Lanoak soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope and the very cobbly surface of the Camelback and Cedarhill soils.

This map unit is in capability subclass VIIe.

24—Camelback-Greys complex, 20 to 30 percent slopes. This map unit is on fan terraces and mountain foot slopes. The native vegetation is mainly shrubs and grasses on the Camelback soil and trees and grasses on the Greys soil. Elevation is about 5,500 to 6,500 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period is about 65 days.

This unit is about 40 percent Camelback gravelly silt loam and about 35 percent Greys silt loam. The Camelback soil is dominantly on south- and west-facing, convex side slopes, and the Greys soil is on north- and east-facing, concave side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Lanoak silt loam in concave pockets on south- and west-facing side slopes, about 5 percent is Camelback extremely stony silt loam on toe slopes, and about 5 percent is Valmar very cobbly silt loam on ridgetops and near areas of Rock outcrop. The remaining 10 percent is small areas of Rock outcrop, soils that have slopes of less than 20 percent or more than 30 percent, and Trailcreek very fine sandy loam.

The Camelback soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from quartzite. Typically, the surface layer is dark brown gravelly silt loam 21 inches thick. The upper 9 inches of the subsoil is dark brown extremely gravelly silt loam, and the lower part to a depth of 60 inches or more is yellowish brown extremely gravelly silt loam.

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

The Greys soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, an intermittent duff layer of leaves, twigs, and grasses about 3 inches thick is on the surface. The surface layer is dark grayish brown silt loam 8 inches thick. The upper 4 inches of the next layer is light

brownish gray silt loam, and the lower part to a depth of 19 inches is 60 percent light brownish gray silt loam and 40 percent brown silt loam. The subsoil to a depth of 60 inches or more is brown, light yellowish brown, and pale brown silt loam.

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

This unit is used as rangeland and grazeable woodland.

The potential natural plant community on the Camelback soil is mainly mountain big sagebrush and bluebunch wheatgrass. The potential natural plant community on the Greys soil is mainly an overstory of quaking aspen with an understory dominated by pine reedgrass.

The Camelback soil is well suited to use as rangeland. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope and the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

The Greys soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 10 to 20 years after the canopy is opened by logging, fire, or some other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth to withstand grazing pressure.

The Greys soil is also suited to the production of quaking aspen for wood products such as fenceposts and firewood. On the basis of an 80-year site curve, the average site index for quaking aspen is 65. Yield tables indicate that the maximum average annual growth is 36 cubic feet per acre of quaking aspen at 80 years of age. Most of the aspen harvested is used as firewood.

This map unit is in capability subclass VIe.

25—Camelback-Hades complex, 6 to 20 percent slopes. This map unit is on mountain foot slopes and fan terraces. The native vegetation is mainly shrubs and grasses. Elevation is about 5,200 to 7,000 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period is about 70 days.

This unit is about 50 percent Camelback extremely stony silt loam and about 30 percent Hades gravelly silt loam. The Camelback soil is on convex side slopes, and the Hades soil is on concave side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Lanoak silt loam on concave, north-facing side slopes, about 5 percent is soils that are similar to the Hades soil but are in drainageways, about 5 percent is Moonlight silt loam on concave side slopes along drainageways, and about 5 percent is soils that have slopes of more than 20 percent.

The Camelback soil is very deep and well drained. It formed in alluvium derived dominantly from quartzite. Typically, the surface layer is dark brown extremely stony silt loam 21 inches thick. The upper 9 inches of the subsoil is dark brown extremely cobbly silt loam, and the lower part to a depth of 60 inches or more is yellowish brown extremely cobbly silt loam.

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

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass and mountain big sagebrush. Mechanical equipment such as rangeland plows and drills is suitable for use on the Hades soil, but its use is limited on the Camelback soil because of the extremely stony surface.

This map unit is in capability subclass VIIs.

26—Camelback-Valmar-Hades complex, 20 to 30 percent slopes. This map unit is on mountainsides. The native vegetation is mainly shrubs and grasses. Elevation is about 5,500 to 6,500 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period is about 75 days.

This unit is about 40 percent Camelback gravelly silt loam, about 20 percent Valmar very cobbly silt loam, and about 20 percent Hades gravelly silt loam. The Camelback soil is dominantly on convex side slopes, the Valmar soil is on ridgetops and near areas of Rock outcrop, and the Hades soil is dominantly on concave side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 10 percent is Moonlight silt loam on north- and east-facing, concave side slopes and about 5 percent is Rexburg silt loam on the lower lying, loess-covered side slopes. The remaining 5 percent is small areas of Rock outcrop and soils that have slopes of less than 20 percent or more than 30 percent.

The Camelback soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from quartzite. Typically, the surface layer is dark brown gravelly silt loam 21 inches thick. The subsoil is dark brown and yellowish brown extremely cobbly silt loam 21 inches thick. Quartzite is at a depth of 42 inches. Depth to bedrock ranges from 40 to 60 inches.

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

The Valmar soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived from quartzite. Typically, the surface layer is dark brown and brown very cobbly silt loam 9 inches thick. The upper 5 inches of the subsoil is yellowish brown very cobbly silt loam, and the lower 10 inches is yellowish brown extremely stony silt loam. Quartzite is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

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

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass and mountain big sagebrush. This unit is poorly suited to the use of mechanical equipment such as rangeland plows and drills. The main limitations are the very cobbly surface of the Valmar soil and the very high hazard of erosion. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass VIe.

27—Camelback Variant-Valmar Variant complex, 20 to 60 percent slopes. This map unit is on mountainsides and ridges. The native vegetation is mainly shrubs and grasses. Elevation is about 7,500 to 9,200 feet. The average annual precipitation is about 20 inches, the average annual air temperature is about 39 degrees F, and the average frost-free period is less than 70 days.

This unit is about 45 percent Camelback Variant gravelly silt loam and about 30 percent Valmar Variant very stony silt loam. The Camelback Variant soil is in slightly convex to concave, south- and west-facing side slopes. The Valmar Variant soil is on convex, south- and west-facing side slopes and ridgetops.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Scout Variant gravelly silt loam in concave pockets; about 5 percent is Rock outcrop and talus, including vertical cliffs 50 to 750 feet high; and about 5 percent is soils that are similar to the Valmar Variant soil but are less than 20 inches deep to bedrock and are on windswept ridges. The remaining 5 percent is small areas of a soil that is similar to the Valmar Variant soil but is calcareous throughout, Camelback extremely stony silt loam, Ireland extremely stony silt loam, and soils that have slopes of less than 20 percent or more than 60 percent.

The Camelback Variant soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from quartzite. Typically, the surface layer is very dark grayish brown and dark brown gravelly silt loam 10 inches thick. The upper 21 inches of the subsoil is yellowish brown very cobbly loam, and the lower part to a depth of 60 inches or more is yellowish brown extremely cobbly loam.

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

The Valmar Variant soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from quartzite. Typically, the surface layer is dark brown very stony silt loam 9 inches thick. The subsoil is dark yellowish brown and light yellowish brown very stony loam and extremely stony loam 15 inches thick. Quartzite bedrock is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly subalpine big sagebrush, mountain snowberry, and slender wheatgrass. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope and very stony surface of the Valmar Variant soil. Use of forage by livestock in some areas of this unit is limited by the

steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth to withstand grazing pressure.

This map unit is in capability subclass VIIe.

28—Cedarhill very cobbly silt loam, 30 to 60 percent slopes. This very deep, well drained soil is on south- and west-facing mountainsides and foothills (fig. 3). It formed in alluvium and colluvium derived from limestone and other related sedimentary and metasedimentary rock. The native vegetation is mainly small trees, shrubs, and grasses. Elevation is about 5,000 to 6,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 85 days.

Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of

Figure 3.—Area of Cedarhill very cobbly silt loam, 30 to 60 percent slopes.

the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Rock outcrop on ridgetops, about 5 percent is soils that are similar to the Cedarhill soil but are less than 40 inches deep to bedrock and are near areas of Rock outcrop, about 5 percent is Ririe silt loam on north- and east-facing side slopes and in concave pockets, and about 5 percent is soils that have slopes of less than 30 percent. The remaining 5 percent is small areas of volcanic ash outcrops and Trailcreek very fine sandy loam.

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

This unit is used primarily as grazeable woodland. A few areas are used as woodland.

This unit is suited to use as grazeable woodland. The potential natural plant community on the unit is mainly Utah juniper, bluebunch wheatgrass, and Indian ricegrass. The main limitations are the steepness of slope and the small amount of desirable forage. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope and the very cobbly surface of the soil.

In a few areas, some Utah juniper is cut for fenceposts and firewood. On the basis of a basal area attained when the diameter of trees at a height of 1 foot averages 5 inches, the average site index for Utah juniper is 105. Yield tables indicate that the maximum average annual growth is 31 cubic feet per acre of Utah juniper at 100 years of age.

This map unit is in capability subclass VIIe.

29—Cedarhill-Ireland-Rock outcrop complex, 30 to 60 percent slopes. This map unit is on mountainsides. The native vegetation is mainly small trees, shrubs, and grasses. Elevation is about 5,200 to 7,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 80 days.

This unit is about 30 percent Cedarhill very cobbly silt loam, about 25 percent Ireland extremely stony silt loam, and about 20 percent Rock outcrop. The Cedarhill soil is on plane to slightly concave side slopes, the Ireland soil is on convex side slopes, and Rock outcrop is on convex side slopes and near ridgetops. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Pavohroo silt loam on concave, north- and east-facing side slopes, about 5 percent is Camelback very cobbly silt loam on concave side slopes, about 5 percent is soils that are similar to the Ireland soil but are less than 20 inches deep to bedrock and are on convex side slopes and ridgetops, and about 5 percent is Greys silt loam on concave, north- and east-facing foot slopes. The remaining 5 percent is small areas of Coalbank very fine sandy loam, Trailcreek very fine sandy loam, and soils that have slopes of less than 30 percent.

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and other related sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

The Ireland soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from interbedded dolomite, limestone, and sandstone. Typically, the surface layer is brown extremely stony silt loam 7 inches thick. The upper 5 inches of the subsoil is brown very stony silt loam, and the lower 18 inches is brown, calcareous extremely stony silt loam. Dolomite is at a depth of 30 inches. Depth to bedrock ranges from 20 to 40 inches.

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

Rock outcrop consists of areas of exposed dolomite and limestone. It is near ridgetops and on very convex side slopes.

The Cedarhill soil is used as grazeable woodland and woodland. The Ireland soil is used as rangeland.

This unit is suited to use as grazeable woodland and rangeland. The potential natural plant community on the Cedarhill soil is mainly bluebunch wheatgrass, Indian ricegrass, and Utah juniper. The potential natural plant community on the Ireland soil is mainly curlleaf mountainmahogany, mountain big sagebrush, and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Livestock watering facilities need to be developed or improved for summer

and fall use of this unit. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope, the very cobbly surface of the Cedarhill soil, the extremely stony surface of the Ireland soil, and the areas of Rock outcrop.

In a few areas of the Cedarhill soil, some Utah juniper is cut for fenceposts and firewood. On the basis of a basal area attained when the diameter of trees at a height of 1 foot averages 5 inches, the average site index for Utah juniper is 105. Yield tables indicate that the maximum average annual growth is 31 cubic feet per acre of Utah juniper at 100 years of age.

This map unit is in capability subclass VIIs.

30—Cedarhill-Ririe-Watercanyon complex, 30 to 60 percent slopes. This map unit is on foothills and mountainsides. The native vegetation is mainly small trees, shrubs, and grasses. Elevation is about 4,900 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

This unit is about 35 percent Cedarhill very cobbly silt loam, about 25 percent Ririe silt loam, and about 20 percent Watercanyon silt loam. The Cedarhill soil is on convex, south- and west-facing side slopes, the Ririe soil is on plane or slightly concave, north- and east-facing side slopes, and the Watercanyon soil is on plane or slightly concave, south- and west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Valmar very cobbly silt loam on ridgetops, about 5 percent is Camelback gravelly silt loam on north- and east-facing, convex side slopes, and about 5 percent is soils that are less than 20 inches deep to bedrock and are on ridgetops. The remaining 5 percent is small areas of Rock outcrop, volcanic ash outcrops, Trailcreek very fine sandy loam, soils that have slopes of less than 30 percent, and very deep soils in drainageways.

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and related sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

The Ririe soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

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

The Watercanyon soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is pale brown, calcareous silt loam 7 inches thick. The subsoil is pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, light gray, and very pale brown, calcareous silt loam.

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

The Cedarhill soil is used as grazeable woodland and woodland. The Ririe and Watercanyon soils are used as rangeland.

This unit is suited to use as grazeable woodland and rangeland. The potential natural plant community on the Cedarhill soil is mainly Utah juniper, bluebunch wheatgrass, and Indian ricegrass. The potential natural plant community on the Ririe soil is mainly mountain big sagebrush and bluebunch wheatgrass. The potential natural plant community on the Watercanyon soil is mainly mountain big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. Use of forage by livestock on parts of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope and the very cobbly surface of the Cedarhill soil.

In a few areas of the Cedarhill soil, some Utah juniper is cut for fenceposts and firewood. On the basis of a basal area attained when the diameter of trees at a height of 1 foot averages 5 inches, the average site index for Utah juniper is 105. Yield tables indicate that the maximum average annual growth is 31 cubic feet per acre of Utah juniper at 100 years of age.

This map unit is in capability subclass VIIe.

31—Cedarhill-Rock outcrop complex, 30 to 60 percent slopes. This map unit is on mountainsides. The native vegetation is mainly small trees, shrubs, and grasses. Elevation is 5,000 to 6,500 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 80 days.

This unit is about 45 percent Cedarhill very cobbly silt loam and about 30 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Ridgecrest extremely stony silt loam on convex ridges and near areas of Rock outcrop, about 5 percent is Watercanyon silt loam in slightly concave areas, and about 5 percent is Hondoho cobbly silt loam on north- and east-facing side slopes. The remaining 5 percent is small areas of soils that are similar to the Cedarhill soil but that have color hues of 5YR or redder and soils that have slopes of less than 30 percent or more than 60 percent.

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and other related sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

Rock outcrop consists of areas of exposed sandstone, dolomite, and limestone. It is weathered and fractured and is most commonly on ridgetops and in convex areas on secondary ridges.

This unit is used as grazeable woodland and woodland.

This unit is suited to use as grazeable woodland. The potential natural plant community on the unit is mainly Utah juniper, bluebunch wheatgrass, and Indian ricegrass. The main limitations are the steepness of slope, and areas of Rock outcrop. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope, the areas of Rock outcrop, and the very cobbly surface of the Cedarhill soil.

In a few areas of the Cedarhill soil, some Utah juniper is cut for fenceposts and firewood. On the basis of a basal area attained when the diameter of trees at a height of 1 foot averages 5 inches, the average site index for Utah juniper is 105. Yield tables indicate that the maximum average annual growth is 31 cubic feet per acre of Utah juniper at 100 years of age.

This map unit is in capability subclass VIIe.

32—Cedarhill, high precipitation-Camelback-Moonlight complex, 20 to 50 percent slopes. This map unit is on mountainsides and foot slopes. The native vegetation is mainly shrubs and grasses. Elevation is 5,000 to 6,500 feet.

This unit is about 30 percent Cedarhill very gravelly silt loam, high precipitation, about 25 percent Camelback gravelly silt loam, and about 20 percent Moonlight silt loam. The Cedarhill soil is on south- and west-facing, convex side slopes, the Camelback soil is on slightly convex to slightly concave, north- and east-facing side slopes, and the Moonlight soil is in concave pockets near drainageways on north- and east-facing side slopes . The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Lanoak silt loam in concave pockets on foot slopes, about 5 percent is a soil that is less than 20 inches deep to fractured bedrock and is on ridgetops and convex side slopes, and about 5 percent is a very deep soil along drainageways. The remaining 5 percent is small areas of Rock outcrop, Manila silt loam, Yago extremely stony silty clay loam, and soils that have slopes of less than 20 percent.

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived from sedimentary and metasedimentary rock. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 80 days. Typically, the surface layer is brown, calcareous very gravelly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous extremely gravelly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous extremely gravelly loam.

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

The Camelback soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from quartzite. The average annual precipitation is about 16 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days. Typically, the surface layer is dark brown gravelly silt loam 21 inches thick. The subsoil is dark brown and yellowish brown extremely cobbly silt loam 21 inches thick. Quartzite bedrock is at a depth of 42 inches. Depth to bedrock ranges from 40 to 60 inches.

Permeability of the Camelback soil is moderate. Available water capacity is low. Effective rooting depth is

40 to 60 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Moonlight soil is very deep and well drained. It formed in alluvium derived from loess and from sedimentary and metasedimentary rock. The average annual precipitation is about 18 inches, the average annual air temperature is about 38 degrees F, and the average frost-free period is about 50 days. Typically, the surface is covered with an intermittent duff layer of leaves, twigs, and grasses about 2 inches thick. The surface layer is very dark grayish brown, dark grayish brown, and dark brown silt loam 24 inches thick. The subsoil to a depth of 60 inches or more is light yellowish brown and brown silt loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the Cedarhill and Camelback soils is mainly bluebunch wheatgrass and mountain big sagebrush. The potential natural plant community on the Moonlight soil is mainly mountain brome, common chokecherry, Rocky Mountain maple, and quaking aspen. Use of forage by livestock on parts of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope.

This map unit is in capability subclass VIIe.

33—Cedarhill, high precipitation-Hades-Ricrest complex, 20 to 50 percent slopes. This map unit is on foothills and mountainsides. The native vegetation is mainly shrubs and grasses. Elevation is about 5,500 to 6,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 80 days.

This unit is about 40 percent Cedarhill very gravelly silt loam, high precipitation, about 25 percent Hades gravelly silt loam, and about 20 percent Ricrest gravelly silt loam. The Cedarhill soil is on south- and west-facing, convex side slopes, the Hades soil is on north- and east-facing, concave side slopes, and the Ricrest soil is on south- and west-facing foot slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Manila silt loam on south- and west-facing, concave side slopes, and about 5 percent is Moonlight silt loam on concave, north- and east-facing side slopes. The remaining 5 percent is small areas of Ririe silt loam, Rock outcrop, Ridgecrest extremely stony silt loam, Coalbank very fine sandy loam, Trailcreek very fine sandy loam, and a very deep soil along drainageways.

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived from limestone and other sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very gravelly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous extremely gravelly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous extremely gravelly loam.

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

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

The Ricrest soil is very deep and well drained. It formed in alluvium and colluvium derived from mixed sources, dominantly quartzite and limestone. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 10 inches thick. The upper 4 inches of the subsoil is brown gravelly silt loam, and the lower 10 inches is brown, calcareous gravelly silt loam. The substratum to a depth of 60 inches or more is pale brown and very pale brown, calcareous gravelly silt loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope.

This map unit is in capability subclass VIIe.

34—Cedarhill, high precipitation-Hondoho-Arbone complex, 20 to 50 percent slopes. This map unit is in south- and west-facing areas on terrace breaks and mountain foot slopes. The native vegetation is mainly

shrubs and grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 85 days.

This unit is about 45 percent Cedarhill very cobbly silt loam, high precipitation, about 20 percent Hondoho cobbly silt loam, and about 15 percent Arbone gravelly silt loam. The Cedarhill soils are on convex side slopes and ridges, the Hondoho soils are on slightly concave side slopes, and the Arbone soil is on the lower part of the slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 10 percent is Watercanyon silt loam on slightly convex side slopes and about 5 percent is Ririe silt loam on concave side slopes. The remaining 5 percent is small areas of Bancroft silt loam, Rock outcrop, and soils that have slopes of less than 20 percent or more than 50 percent.

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived from various kinds of sedimentary and metasedimentary rock. Slope is 20 to 50 percent. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

The Hondoho soil is very deep and well drained. It formed in alluvium derived from mixed sources. Slope is 20 to 50 percent. Typically, the surface layer is grayish brown cobbly silt loam 8 inches thick. The subsoil is brown, calcareous cobbly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very cobbly sandy clay loam.

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

The Arbone soil is very deep and well drained. It formed in silty alluvium derived from mixed sources. Slope is 20 to 30 percent. Typically, the surface layer is grayish brown gravelly silt loam 9 inches thick. The subsoil is brown and pale brown, calcareous gravelly silt loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown, calcareous gravelly silt loam.

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

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on this unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the very cobbly surface of the Cedarhill soil and because of the steepness of slope.

This map unit is in capability subclass VIIe.

35—Cedarhill, high precipitation-Hondoho-Ridgecrest complex, 20 to 50 percent slopes. This map unit is on mountainsides and foothills. The native vegetation is mainly shrubs and grasses. Elevation is about 5,100 to 6,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 75 days.

This unit is about 35 percent Cedarhill very cobbly silt loam, high precipitation, about 30 percent Hondoho cobbly silt loam, and about 20 percent Ridgecrest extremely stony silt loam. The Cedarhill soil is on south- and west-facing side slopes, the Hondoho soil is on foot slopes and on concave side slopes, and the Ridgecrest soil is near ridgetops and on convex side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Rock outcrop, which is generally near ridgetops but it may occur anywhere in the unit, and about 5 percent is Rexburg silt loam on foot slopes. The remaining 5 percent is small areas of Manila silt loam, soils that are similar to the Ridgecrest soil but are less than 20 inches deep to bedrock, and soils that have slopes of less than 20 percent.

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and related sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

The Hondoho soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown cobbly silt loam 8 inches thick. The subsoil is brown, calcareous cobbly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very cobbly loam.

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

The Ridgecrest soil is moderately deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone. Typically, the surface layer is dark grayish brown and brown, calcareous extremely stony silt loam 14 inches thick. The underlying material to a depth of 27 inches is pale brown, calcareous extremely stony silt loam. Limestone is at a depth of 27 inches. Depth to bedrock ranges from 20 to 40 inches.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on this unit is mainly bluebunch wheatgrass and mountain big sagebrush. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the very cobbly surface of the Cedarhill soil, the extremely stony surface of the Ridgecrest soil, and the steepness of slope.

This map unit is in capability subclass VIIe.

36—Cedarhill, high precipitation-Manila complex, 30 to 50 percent slopes. This map unit is on mountainsides and foothills. The native vegetation is mainly shrubs and grasses. Elevation is about 5,300 to 6,300 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days.

This unit is about 40 percent Cedarhill very cobbly silt loam, high precipitation, and about 35 percent Manila silt loam. The Cedarhill soil is generally on convex, south- and west-facing side slopes and ridgetops, and the Manila soil is generally on concave, north- and east-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Hades gravelly silt loam, about 5 percent is Bancroft silt loam, and about 5 percent is Trailcreek very fine sandy loam and outcrops of volcanic ash or tuff. The remaining 10 percent is small areas of Yago extremely stony silty clay loam, soils that are similar to the Manila soil but are calcareous throughout, and soils that have slopes of less than 30 percent or more than 50 percent.

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and related sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

The Manila soil is very deep and well drained. It formed in alluvium derived from sedimentary and metasedimentary rock and loess. Typically, the upper part of the surface layer is grayish brown silt loam 7 inches thick and the lower part is grayish brown silty clay loam 8 inches thick. The subsoil is yellowish brown and dark brown silty clay and silty clay loam 33 inches thick. The substratum to a depth of 60 inches or more is pale brown and light yellowish brown, calcareous silt loam.

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

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope, the very high hazard of water erosion, and the very cobbly surface of the Cedarhill soil.

This map unit is in capability subclass VIIe.

37—Cedarhill, high precipitation-Trailcreek-Coalbank complex, 20 to 50 percent slopes. This map unit is on mountainsides and fan terrace escarpments. The native vegetation is mainly shrubs and grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 80 days.

This unit is about 35 percent Cedarhill very cobbly silt loam, high precipitation, about 20 percent Trailcreek very fine sandy loam, and about 20 percent Coalbank very fine sandy loam. The Cedarhill soil is on convex side

slopes and ridges, the Trailcreek soil is on slightly convex to slightly concave side slopes, and the Coalbank soil is on concave side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Lonigan cobbly silt loam on slightly concave, south- and west-facing side slopes, about 5 percent is Ricrest gravelly silt loam on the lower part of side slopes below areas of the Cedarhill soil, and about 5 percent is Hondoho cobbly silt loam on ridges. The remaining 5 percent is small areas of very deep soils in drainageways, Rock outcrop consisting of tuff and volcanic breccia, Moonlight silt loam, and soils that have slopes of less than 20 percent or more than 50 percent.

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived from various kinds of sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

The Trailcreek soil is moderately deep to consolidated volcanic ash and is well drained. It formed in alluvium and residuum derived from consolidated volcanic ash. Typically, the surface layer is grayish brown very fine sandy loam 4 inches thick. The subsoil is grayish brown and light brownish gray very fine sandy loam 22 inches thick. Consolidated volcanic ash is at a depth of 26 inches. Depth to consolidated volcanic ash ranges from 20 to 40 inches.

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

The Coalbank soil is very deep and well drained. It formed in alluvium and residuum derived from volcanic ash. Typically, the surface layer is brown very fine sandy loam 6 inches thick. The subsoil is brown very fine sandy loam 27 inches thick. The substratum to a depth of 60 inches or more is light gray very fine sandy loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. Use of mechanical equipment such as rangeland plows and drills is not practical on this unit because of the steepness of slope and the very cobbly surface of the Cedarhill soil.

This map unit is in capability subclass VIIe.

38—Coalbank very fine sandy loam, 4 to 12 percent slopes. This very deep, well drained soil is on foothills and terraces. It formed in alluvium and residuum derived from volcanic ash. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 45 degrees F, and the average frost-free period is about 85 days.

Typically, the surface layer is brown very fine sandy loam 6 inches thick. The subsoil is brown very fine sandy loam 27 inches thick. The substratum to a depth of 60 inches or more is light gray very fine sandy loam.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Trailcreek very fine sandy loam on south- and west-facing side slopes and about 10 percent is Lonigan cobbly silt loam on convex side slopes and ridges. The remaining 5 percent is small areas of Rexburg silt loam, Watercanyon silt loam, Camelback very cobbly silt loam, Inkom silt loam, and soils that have slopes of less than 4 percent or more than 12 percent.

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

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

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by the high hazard of water erosion and low natural fertility. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The unit is suited to the use of mechanical equipment such

as rangeland plows and drills. The main limitation is the high hazard of water erosion. Nonmechanical treatment practices may be more suitable. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. The unit is limited for livestock watering ponds and other water impoundments by the seepage potential.

This map unit is in capability subclass IIIe.

39—Coalbank-Trailcreek-Lonigan complex, 12 to 20 percent slopes. This map unit is on foothills. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 85 days.

This unit is about 30 percent Coalbank very fine sandy loam, about 25 percent Trailcreek very fine sandy loam, and about 20 percent Lonigan cobbly silt loam. The Coalbank soil is on concave side slopes, the Trailcreek soil is on slightly convex side slopes, and the Lonigan soil is on convex side slopes and ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Cedarhill very cobbly silt loam, high precipitation, on south- and west-facing side slopes and ridges; about 5 percent is Bancroft silt loam on plane, north-facing side slopes; about 5 percent is Ririe silt loam on smooth broad ridges; and about 5 percent is Arbone gravelly silt loam on south- and west-facing side slopes near drainageways. The remaining 5 percent is small areas of soils that have a weakly cemented pan at a depth of 20 to 40 inches, volcanic breccia outcrops, and soils that have slopes of less than 12 percent or more than 20 percent.

The Coalbank soil is very deep and well drained. It formed in alluvium and residuum derived from volcanic ash. Typically, the surface layer is brown very fine sandy loam 6 inches thick. The subsoil is brown very fine sandy loam 27 inches thick. The substratum to a depth of 60 inches or more is light gray very fine sandy loam.

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

The Trailcreek soil is moderately deep to consolidated volcanic ash and is well drained. It formed in alluvium and residuum derived from consolidated volcanic ash. Typically, the surface layer is grayish brown very fine sandy loam 4 inches thick. The subsoil is grayish brown and light brownish gray very fine sandy loam 22 inches thick. Consolidated volcanic ash is at a depth of 26 inches. Depth to consolidated volcanic ash ranges from 20 to 40 inches.

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

The Lonigan soil is moderately deep to consolidated volcanic ash and is well drained. It formed in alluvium and residuum derived from consolidated volcanic ash. Typically, the surface layer is dark grayish brown and grayish brown cobbly silt loam 7 inches thick. The subsoil is brown, calcareous very cobbly silt loam 5 inches thick. The upper 7 inches of the substratum is pale brown, calcareous very cobbly loam, and the lower part to a depth of 27 inches is white, calcareous extremely cobbly loam. Consolidated volcanic ash is at a depth of 27 inches. Depth to consolidated volcanic ash ranges from 20 to 40 inches.

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

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

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. The unit is limited for livestock watering ponds and other water impoundments by the seepage potential. It is poorly suited to the use of mechanical equipment such as rangeland plows and drills. It is limited mainly by the very high hazard of water erosion and the cobbly surface of the Lonigan soil. Nonmechanical treatment practices may be more suitable.

This unit is poorly suited to nonirrigated crops. It is used for the production of wheat and barley. It is limited mainly by the very high hazard of water erosion, the cobbly surface of the Lonigan soil, and the low available water capacity of the Lonigan and Trailcreek soils. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Seeding to permanent cover may be needed to reduce erosion. The cobbly surface of the Lonigan soil may hinder the use of machinery.

This map unit is in capability subclass VIe.

40—Coalbank-Trailcreek-Lonigan complex, 20 to 50 percent slopes. This map unit is on mountainsides and foothills. The native vegetation is mainly shrubs and

grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 85 days.

This unit is about 25 percent Coalbank very fine sandy loam, about 25 percent Trailcreek very fine sandy loam, and about 25 percent Lonigan cobbly silt loam. The Coalbank soil is on concave side slopes, the Trailcreek soil is on plane to slightly convex side slopes, and the Lonigan soil is on convex side slopes and ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 15 percent is Cedarhill very cobbly silt loam, high precipitation, on limestone ridges and about 5 percent is Ricrest gravelly silt loam on slightly concave side slopes. The remaining 5 percent is small areas of Lanoak silt loam, Moonlight silt loam, soils that have slopes of less than 20 percent or more than 50 percent, and Rock outcrop consisting of tuff, volcanic breccia, and rhyolite.

The Coalbank soil is very deep and well drained. It formed in alluvium and residuum derived from volcanic ash. Typically, the surface layer is brown very fine sandy loam 6 inches thick. The subsoil is brown very fine sandy loam 27 inches thick. The substratum to a depth of 60 inches or more is light gray very fine sandy loam.

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

The Trailcreek soil is moderately deep to consolidated volcanic ash and is well drained. It formed in alluvium and residuum derived from consolidated volcanic ash. Typically, the surface layer is grayish brown very fine sandy loam 4 inches thick. The subsoil is grayish brown and light brownish gray very fine sandy loam 22 inches thick. Consolidated volcanic ash is at a depth of 26 inches. Depth to consolidated volcanic ash ranges from 20 to 40 inches.

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

The Lonigan soil is moderately deep to consolidated volcanic ash and is well drained. It formed in alluvium and residuum derived from consolidated volcanic ash. Typically, the surface layer is dark grayish brown and grayish brown cobbly silt loam 7 inches thick. The subsoil is brown, calcareous very cobbly silt loam 5 inches thick. The upper 7 inches of the substratum is pale brown, calcareous very cobbly loam, and the lower part to a depth of 27 inches is white, calcareous extremely cobbly loam. Consolidated volcanic ash is at a depth of 27 inches. Depth to consolidated volcanic ash ranges from 20 to 40 inches.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. This unit is limited for livestock watering ponds and other water impoundments by the seepage potential. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope.

This map unit is in capability subclass VIIe.

41—Downata-Bear Lake complex, drained, 0 to 1 percent slopes. This map unit is on flood plains and low terraces. Drainage of the unit has been altered by dredging and straightening of stream channels. The native vegetation is mainly sedges and grasses. Elevation is about 4,500 to 4,800 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

This unit is about 45 percent Downata silt loam and about 30 percent Bear Lake silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is very poorly drained soils that are similar to the Downata and Bear Lake soils, about 5 percent is Tendoy muck in depressional areas, and about 5 percent is Inkom silt loam along edges of the bottom lands. The remaining 5 percent is small ponds and small areas of soils that are similar to the Downata and Bear Lake soils but have layers of sand and gravel or are moderately saline to very strongly saline. The saline soils are south of Swan Lake, along the southern boundary of the survey area.

The Downata soil is very deep and poorly drained. It formed in silty alluvium derived from mixed sources. Typically, the surface is covered with a mat of undecomposed grass and moss 2 inches thick. The surface layer is grayish brown, calcareous silt loam 6 inches thick. The subsoil is grayish brown, calcareous silt loam 8 inches thick. Below this is a buried surface layer of dark gray, calcareous silty clay loam 6 inches thick. The next layer is a buried subsoil of gray, calcareous silty clay loam 10 inches thick. The upper 10 inches of the substratum is light brownish gray, calcareous silty clay loam, and the lower part to a depth of 60 inches or more is light gray, calcareous silt loam.

Permeability of the Downata soil is moderately slow. Available water capacity is high. Effective rooting depth

for plants, except those that are water tolerant, is limited by a seasonal high water table that is at a depth of 0 to 1.5 feet from January through June. Runoff is very slow, and the hazard of water erosion is slight. The soil is frequently flooded for brief periods from January through June.

The Bear Lake soil is very deep and poorly drained. It formed in silty alluvium derived from mixed sources. Typically, the surface layer is dark grayish brown, calcareous silt loam 12 inches thick. The subsoil is light gray, calcareous silty clay loam 12 inches thick. The upper 16 inches of the substratum is light gray, calcareous silty clay loam, and the lower part to a depth of 60 inches or more is light gray, calcareous silt loam.

Permeability of the Bear Lake soil is moderately slow. Available water capacity is high. Effective rooting depth for plants, except those that are water tolerant, is limited by a seasonal high water table that is at a depth of 0 to 1.5 feet from January through June. Runoff is very slow, and the hazard of water erosion is slight. The soil is frequently flooded for brief periods from January through June.

This unit is used for the production of meadow hay and pasture (fig. 4).

This unit is suited to hay and pasture. The potential natural plant community on the unit is mainly tufted hairgrass and Nebraska sedge and other sedges. The main limitation is wetness. Wetness limits the choice of

Figure 4.—Meadow hay in an area of Downata-Bear Lake complex, 0 to 1 percent slopes.

plants and the period of harvesting or grazing and increases the risk of winterkill. Plants that tolerate wetness should be seeded. Grazing and harvesting of hay should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock and support the weight of harvesting equipment. This unit is capable of producing about 2 tons of grass hay per acre if not irrigated and about 2.5 tons if irrigated.

This map unit is in capability subclass Vw, irrigated and nonirrigated.

42—Downey-Arimo complex, 0 to 3 percent slopes. This map unit is on terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,600 to 4,900 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 95 days.

This unit is about 45 percent Downey gravelly silt loam and about 40 percent Arimo silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is a soil that is similar to the Downey soil but has a stony silt loam surface layer and is on and near terrace breaks and about 5 percent is a soil that is similar to the Arimo soil but is more than 40 inches deep to extremely gravelly coarse sand and is in slightly concave areas. The remaining 5 percent is small areas of Ririe silt loam and soils that have slopes of more than 3 percent.

The Downey soil is very deep and well drained. It formed in silty alluvium overlying flood-deposited sand and gravel of mixed mineralogy. Typically, the surface layer is brown gravelly silt loam 12 inches thick. The upper 5 inches of the underlying material is very pale brown, calcareous gravelly silt loam, and the lower part to a depth of 60 inches or more is multicolored, calcareous extremely gravelly coarse sand. Depth to extremely gravelly coarse sand is 12 to 20 inches.

Permeability of the Downey soil is moderate to a depth of 17 inches and very rapid below this depth. Available water capacity is low. Effective rooting depth is 60 inches or more. In both irrigated and nonirrigated areas, runoff is slow and the hazard of water erosion is slight.

The Arimo soil is very deep and well drained. It formed in loess and silty alluvium overlying flood-deposited sand and gravel of mixed mineralogy. Typically, the surface layer is grayish brown silt loam 6 inches thick. The subsoil is brown silt loam 12 inches thick. The upper 15 inches of the substratum is white, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored, calcareous extremely gravelly coarse sand. Depth to extremely gravelly coarse sand ranges from 20 to 40 inches.

Permeability of the Arimo soil is moderate to a depth of 33 inches and very rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. In both irrigated and nonirrigated areas, runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used as irrigated cropland and rangeland. A few areas are used as nonirrigated cropland and for homesite and urban development.

This unit is suited to irrigated crops. It is used mainly for the production of wheat, barley, and alfalfa hay. The unit is limited mainly by the droughtiness of the Downey soil. Because the Downey soil is droughty, applications of irrigation water should be light and frequent. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. This unit is well suited to the use of mechanical equipment such as rangeland plows and drills. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. This unit is limited for livestock watering ponds and other water impoundments by the seepage potential.

This unit is poorly suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by low precipitation and the droughtiness of the Downey soil. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

If this unit is used for homesite and urban development, the main limitations are the hazard of frost action in the silty overlying material and the hazards of cutbanks caving in and seepage in the underlying extremely gravelly coarse sand. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. Cutbanks are not stable and are subject to slumping. If the density of housing is moderate to high, community sewage systems help to prevent contamination of ground water as a result of seepage from onsite sewage disposal systems.

This map unit is in capability subclasses IIIs, irrigated, and VIs, nonirrigated.

43—Downey-Arimo complex, 3 to 8 percent slopes. This map unit is on terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,600 to 4,900 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 95 days.

This unit is about 55 percent Downey gravelly silt loam and about 30 percent Arimo silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is a soil that is similar to the Downey soil but has a stony silt loam surface layer and is on terrace breaks and about 5 percent is a soil that is similar to the Downey soil but is less than 10 inches deep to sand and gravel and is in slightly convex areas. The remaining 5 percent is small areas of soils that have slopes of less than 3 percent or more than 8 percent and Bear Lake silt loam.

The Downey soil is very deep and well drained. It formed in silty alluvium overlying flood-deposited sand and gravel of mixed mineralogy. Typically, the surface layer is brown gravelly silt loam 12 inches thick. The upper 5 inches of the underlying material is very pale brown, calcareous gravelly silt loam, and the lower part to a depth of 60 inches or more is multicolored, calcareous extremely gravelly coarse sand. Depth to extremely gravelly coarse sand is 12 to 20 inches.

Permeability of the Downey soil is moderate to a depth of 17 inches and very rapid below this depth. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. If this soil is irrigated, runoff is rapid and the hazard of water erosion is high.

The Arimo soil is very deep and well drained. It formed in loess and silty alluvium overlying flood-deposited sand and gravel of mixed mineralogy. Typically, the surface layer is grayish brown silt loam 6 inches thick. The subsoil is brown silt loam 12 inches thick. The upper 15 inches of the substratum is white, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored, calcareous extremely gravelly coarse sand. Depth to extremely gravelly coarse sand ranges from 20 to 40 inches.

Permeability of the Arimo soil is moderate to a depth of 33 inches and very rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. If this soil is irrigated, runoff is rapid and the hazard of water erosion is high.

Most areas of this unit are used as irrigated cropland and rangeland. A few areas are used as nonirrigated cropland and for homesite and urban development.

This unit is suited to irrigated crops. It is used mainly for the production of wheat, barley, and alfalfa hay. The unit is limited mainly by the droughtiness of the Downey soil and the high hazard of water erosion. Because the Downey soil is droughty, applications of irrigation water should be light and frequent. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion. Tillage should be kept to a minimum.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. This unit is well suited to the use of mechanical equipment such as rangeland plows and drills. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. The unit is limited for livestock watering ponds and other water impoundments by the seepage potential.

This unit is poorly suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by low precipitation, the droughtiness of the Downey soil, and the hazard of water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

If this unit is used for homesite and urban development, the main limitations are the hazard of frost action in the silty overlying material, the hazard of cutbanks caving in and the seepage potential in the underlying extremely gravelly coarse sand, and slope. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. If the density of housing is moderate to high, community sewage systems help to prevent contamination of ground water as a result of seepage from onsite sewage disposal systems. Cutbanks are not stable and are subject to slumping.

This map unit is in capability subclasses IIIe, irrigated, and VIe, nonirrigated.

44—Enochville-Enochville Variant complex, 0 to 1 percent slopes. This map unit is on stream terraces. The native vegetation is mainly sedges and grasses. Elevation is about 6,000 to 6,400 feet. The average annual precipitation is about 18 inches, the average

annual air temperature is about 41 degrees F, and the average frost-free period is about 60 days.

This unit is about 40 percent Enochville silt loam and about 35 percent Enochville Variant gravelly silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Holmes very cobbly loam on terrace escarpments, about 10 percent is soils that have a water table at or near the surface, and about 5 percent is soils that are similar to the Enochville and Enochville Variant soils but are moderately well drained and are in convex areas and near the edges of the bottom lands. The remaining 5 percent is small areas of very poorly drained soils that have more than 35 percent clay in the subsoil and upper part of the substratum and soils that have slopes of more than 1 percent.

The Enochville soil is very deep and poorly drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is very dark grayish brown silt loam 12 inches thick. The subsoil is dark grayish brown silty clay loam 8 inches thick. The upper 23 inches of the substratum is grayish brown silt loam, and the lower part to a depth of 60 inches or more is pale olive and pale yellow very cobbly sandy loam and extremely cobbly sandy loam.

Permeability of the Enochville soil is moderately slow. Available water capacity is high. Effective rooting depth for plants, except those that are water tolerant, is limited by a seasonal high water table that is at a depth of 1 to 2 feet from April through June. Runoff is slow, and the hazard of water erosion is slight. This soil is frequently flooded for brief periods from February through June.

The Enochville Variant soil is very deep and poorly drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is dark grayish brown, calcareous gravelly silt loam 11 inches thick. Below this to a depth of 18 inches is a buried surface layer of dark grayish brown, calcareous gravelly silt loam. The next layer is a buried subsoil of dark grayish brown gravelly silt loam 6 inches thick. The upper 6 inches of the substratum is grayish brown very gravelly loam, and the lower part to a depth of 60 inches or more is light brownish gray and light gray, calcareous extremely gravelly loam.

Permeability of the Enochville Variant soil is moderate. Available water capacity is low. Effective rooting depth for plants, except those that are water tolerant, is limited by a seasonal high water table that is at a depth of 1 to 2 feet from April through June. Runoff is slow, and the hazard of water erosion is slight. This soil is frequently flooded for brief periods from February through June.

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly sedges, basin wildrye, and slender wheatgrass. The main limitations are the seasonal high water table and frequent flooding late in winter and in spring. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. The main limitation for rangeland seeding on this unit is the hazard of frequent flooding.

This map unit is in capability subclass Vw.

45—Greys-Pavohroo-Sedgway association, 8 to 20 percent slopes. This map unit is on mountain foot slopes. Elevation is about 6,000 to 7,000 feet.

This unit is about 50 percent Greys silt loam, about 20 percent Pavohroo silt loam, and about 20 percent Sedgway gravelly silt loam. The Greys soil is on slightly concave to plane slopes, the Pavohroo soil is on slightly convex to plane slopes, and the Sedgway soil is on convex ridges and near drainageways.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Yago extremely stony silty clay loam in convex areas on ridges. The remaining 5 percent is small areas of very deep, poorly drained soils near springs, a very deep soil in drainageways, Hades gravelly silt loam, and soils that have slopes of less than 8 percent or more than 20 percent.

The Greys soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. The native vegetation is mainly trees and grasses. The average annual precipitation is about 20 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 60 days. Typically, an intermittent duff layer of leaves, twigs, and grasses about 3 inches thick is on the surface. The surface layer is dark grayish brown silt loam 8 inches thick. The upper 4 inches of the subsurface layer is light brownish gray silt loam, and the lower part, to a depth of 19 inches, is 60 percent light brownish gray silt loam and 40 percent brown silt loam. The subsoil to a depth of 60 inches or more is brown, light yellowish brown, and pale brown silt loam.

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

The Pavohroo soil is very deep and well drained. It formed in silty alluvium and colluvium derived from loess and various kinds of sedimentary and metasedimentary rock. The native vegetation is mainly trees and shrubs. The average annual precipitation is about 25 inches, the average annual air temperature is about 39 degrees F, and the average frost-free period is about 40 days. Typically, an intermittent duff layer of needles, leaves, and twigs about 3 inches thick is on the surface. The surface layer is dark grayish brown silt loam 26 inches

thick. The subsoil to a depth of 60 inches or more is pale brown stony loam.

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

The Sedgway soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from sedimentary and metasedimentary rock. The native vegetation is mainly trees and grasses. The average annual precipitation is about 27 inches, the average annual air temperature is about 38 degrees F, and the average frost-free period is about 40 days. Typically, an intermittent duff layer of needles, leaves, twigs, and grasses about 2 inches thick is on the surface. The upper 5 inches of the surface layer is very dark grayish brown gravelly silt loam, and the lower 7 inches is dark grayish brown very cobbly silt loam. The subsurface layer is pale brown very cobbly loam 9 inches thick. The upper 6 inches of the subsoil is 80 percent yellowish brown very cobbly clay loam and 20 percent pale brown very cobbly loam, and the lower part to a depth of 60 inches or more is yellowish brown very cobbly clay loam.

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

This unit is used as woodland and for grazing.

The potential natural plant community on the Greys soil is mainly an overstory of quaking aspen and an understory dominated by pine reedgrass. The potential natural plant community on the Pavohroo soil is mainly an overstory of Douglas-fir and an understory dominated by mountain snowberry and pine reedgrass. The potential natural plant community on the Sedgway soil is mainly an overstory of Douglas-fir and an understory dominated by pine reedgrass.

The Greys soil is suited to the production of quaking aspen. On the basis of an 80-year site curve, the average site index for quaking aspen is 65. Yield tables indicate that the maximum average annual growth is 36 cubic feet per acre of quaking aspen at 80 years of age. Most of the aspen harvested is used as firewood.

The Pavohroo and Sedgway soils are well suited to the production of Douglas-fir. On the basis of a 50-year site curve, the average site index for Douglas-fir on these soils is 65. Yield tables indicate that the maximum average annual growth is 85 cubic feet per acre of Douglas-fir at 40 years of age. The main concerns in producing and harvesting timber are plant competition, the hazard of water erosion, and seedling mortality. If the overstory canopy is removed, the soil temperature increases. This may hinder the regeneration of timber. Competition from shrubs and grasses may also hinder regeneration. If the site is not adequately prepared, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees. Minimizing the risk of erosion is essential in harvesting timber. Excessive erosion is avoided by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Cuts and fills should be seeded, and water bars and culverts should be installed.

The Greys soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 10 to 20 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

The Pavohroo soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 15 to 30 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 200 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

The Sedgway soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 15 to 30 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

The Greys soil is in capability subclass IVe, and the Pavohroo and Sedgway soils are in capability subclass VIe.

46—Hades gravelly silt loam, 6 to 15 percent slopes. This very deep, well drained soil is on fan terraces and mountain foot slopes. It formed in mixed alluvium derived dominantly from loess and quartzite. The native vegetation is mainly shrubs and grasses. Elevation is about 6,000 to 7,000 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days.

Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Camelback gravelly silt loam on convex side slopes and

about 5 percent is Holmes very cobbly loam on terrace breaks and along drainageways. The remaining 5 percent is small areas of Valmar very cobbly silt loam and Greys silt loam.

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

This unit is used as rangeland and nonirrigated cropland.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush, bluebunch wheatgrass, and slender wheatgrass. This unit is suited to the use of mechanical equipment such as rangeland plows and drills.

This unit is suited to nonirrigated crops. It is limited mainly by the hazard of water erosion and the frost-free period. Practices that can be used to control erosion include seeding early in fall, stubble mulch tillage, and construction of terraces, diversions, and grassed waterways. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the frost-free period is shorter than normal, which significantly reduces yields of crops on this unit.

This map unit is in capability subclass IVe.

47—Hades-Camelback-Hondoho complex, 30 to 60 percent slopes. This map unit is on mountainsides and on terrace escarpments along drainageways. The native vegetation is mainly shrubs and grasses. Elevation is about 5,000 to 6,700 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days.

This unit is about 35 percent Hades gravelly silt loam, about 20 percent Camelback gravelly silt loam, and about 20 percent Hondoho cobbly silt loam. The Hades soil is on north- and east-facing side slopes and in concave positions, the Camelback soil is on convex, north- and east-facing side slopes and on slightly convex, south- and west-facing side slopes, and the Hondoho soil is on south- and west-facing side slopes and in convex areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Cedarhill very cobbly silt loam, about 5 percent is Broadhead silt loam, about 5 percent is Manila silt loam, and about 5 percent is Yago very cobbly silty clay loam. The remaining 5 percent is small areas of Joes silt loam, Trailcreek very fine sandy loam, volcanic ash outcrops, Inkom silt loam, soils that are similar to the Hades soil but are along drainageways, and soils that have slopes of less than 30 percent or more than 50 percent.

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

The Camelback soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from quartzite. Typically, the surface layer is dark brown gravelly silt loam 21 inches thick. The upper 9 inches of the subsoil is dark brown extremely cobbly silt loam, and the lower part to a depth of 60 inches or more is yellowish brown extremely cobbly silt loam.

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

The Hondoho soil is very deep and well drained. It formed in mixed alluvium. Typically, the surface layer is grayish brown cobbly silt loam 8 inches thick. The subsoil is brown, calcareous cobbly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very cobbly sandy clay loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope, the very cobbly surface of the Camelback soil, and the cobbly surface of the Hondoho soil.

This map unit is in capability subclass VIIe.

48—Hades-Holmes complex, 1 to 10 percent slopes. This map unit is on stream terraces. The native vegetation is mainly shrubs and grasses. Elevation is about 6,000 to 6,200 feet. The average annual precipitation is about 18 inches, the average annual air

temperature is about 40 degrees F, and the average frost-free period is about 70 days.

This unit is about 55 percent Hades gravelly silt loam and about 25 percent Holmes very cobbly loam. The Hades soil is in the nearly level areas, and the Holmes soil is on the more steeply sloping terrace breaks. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 10 percent is a soil that is similar to the Holmes soil but has slopes of as much as 60 percent and about 5 percent is Holmes gravelly loam in nearly level areas. The remaining 5 percent is small areas of Enochville silt loam and Enochville Variant gravelly silt loam in drainageways.

The Hades soil is very deep and well drained. It formed in mixed alluvium derived dominantly from quartzite. Slope is 1 to 2 percent. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

The Holmes soil is very deep and well drained. It formed in mixed alluvium derived dominantly from quartzite. Slope is 6 to 10 percent. Typically, the surface layer is dark grayish brown and dark brown very cobbly loam 8 inches thick. The upper 8 inches of the subsoil is dark yellowish brown very cobbly loam, and the lower 12 inches is yellowish brown very cobbly clay loam. The substratum to a depth of 60 inches or more is multicolored extremely gravelly loamy coarse sand.

Permeability of the Holmes soil is moderate to a depth of 28 inches and rapid below this depth. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of mechanical equipment such as rangeland plows and drills is not practical on the Holmes soil because the surface is very cobbly. The suitability of the Hades soil for rangeland seeding is good.

This map unit is in capability subclass IVc.

49—Hades-Lanoak complex, 4 to 12 percent slopes. This map unit is on foothills and terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,700 to 5,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 80 days.

This unit is about 45 percent Hades gravelly silt loam and about 35 percent Lanoak silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Oxford silty clay loam on convex side slopes, about 5 percent is Hondoho cobbly silt loam on convex side slopes and along terrace breaks, and about 5 percent is Camelback very cobbly silt loam on convex side slopes and ridges. The remaining 5 percent is small areas of Bancroft silt loam and Hades and Lanoak soils that have slopes of less than 4 percent or more than 12 percent.

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

The Lanoak soil is very deep and well drained. It formed in silty alluvium derived from loess. Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

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

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

This unit is well suited to nonirrigated crops. It is used for the production of wheat, barley, and alfalfa hay. The unit is limited mainly by the high hazard of water erosion. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Erosion can be reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass and mountain big sagebrush. This

unit is suited to the use of mechanical equipment such as rangeland plows and drills.

This map unit is in capability subclass IIIe.

50—Hades-Lanoak-Camelback complex, 20 to 50 percent slopes. This map unit is on mountainsides and fan terraces. The native vegetation is mainly shrubs and grasses. Elevation is about 5,300 to 6,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period is about 75 days.

This unit is about 25 percent Hades gravelly silt loam, about 25 percent Lanoak silt loam, and about 25 percent Camelback gravelly silt loam. The Hades soil is on north- and east-facing, concave side slopes, the Lanoak soil is on the lower part of side slopes and in concave pockets, and the Camelback soil is on north- and east-facing, convex side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Rock outcrop on the upper part of side slopes and along ridgetops; about 5 percent is soils that are similar to this Hades soil but are along drainageways; about 5 percent is Cedarhill very cobbly silt loam, high precipitation, on south- and west-facing, convex side slopes; and about 5 percent is Greys silt loam on the lower part of concave, north- and east-facing side slopes. The remaining 5 percent is small areas of Valmar very cobbly silt loam and soils that have slopes of less than 20 percent or more than 50 percent.

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

The Lanoak soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

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

The Camelback soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from quartzite. Typically, the surface layer is dark brown gravelly silt loam 21 inches thick. The subsoil is dark brown and yellowish brown extremely cobbly silt loam 21 inches thick. Quartzite is at a depth of 42 inches. Depth to bedrock ranges from 40 to 60 inches.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass and mountain big sagebrush. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope and the very high hazard of water erosion.

This map unit is in capability subclass VIIe.

51—Harkness-Sedgway-Mikesell complex, 20 to 50 percent slopes. This map unit is on mountainsides. The native vegetation is mainly trees with an understory dominated by grasses. Elevation is about 6,000 to 8,000 feet. The average annual precipitation is about 27 inches, the average annual air temperature is about 38 degrees F, and the average frost-free period is less than 50 days.

This unit is about 35 percent Harkness silt loam, about 25 percent Sedgway gravelly silt loam, and about 20 percent Mikesell silt loam. The Harkness and Mikesell soils are generally on slightly concave to slightly convex north- and east-facing side slopes at the lower elevations, but they can have any aspect at the higher elevations. The Sedgway soil generally is on convex side slopes that dominantly face south and west.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Dateman cobbly silt loam in convex areas and about 5 percent is Toponce silt loam on concave, south- and west-facing side slopes. The remaining 10 percent is small areas of Yago extremely stony silty clay loam, Valmar very cobbly silt loam, Ireland extremely stony silt loam, Hades gravelly silt loam, Rock outcrop, very deep soils that are poorly drained and somewhat poorly drained, and soils that have slopes of less than 20 percent or more than 50 percent.

The Harkness soil is very deep and well drained. It formed in mixed alluvium derived dominantly from sandstone and quartzite. Typically, an intermittent duff layer of needles, leaves, twigs, and grasses about 2 inches thick is on the surface. The surface layer is dark grayish brown and brown silt loam 8 inches thick. The subsurface layer is pale brown very cobbly loam 6

inches thick. The subsoil to a depth of 60 inches or more is light yellowish brown clay loam and silty clay loam.

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

The Sedgway soil is very deep and well drained. It formed in mixed alluvium and colluvium derived dominantly from sedimentary and metasedimentary rock. Typically, an intermittent duff layer of needles, leaves, twigs, and grasses about 2 inches thick is on the surface. The upper 5 inches of the surface layer is very dark grayish brown gravelly silt loam, and the lower 7 inches is dark grayish brown very cobbly silt loam. The subsurface layer is pale brown very cobbly loam 9 inches thick. The upper 6 inches of the subsoil is 80 percent yellowish brown very cobbly clay loam and 20 percent pale brown very cobbly loam, and the lower part to a depth of 60 inches or more is yellowish brown very cobbly clay loam.

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

The Mikesell soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from sandstone and quartzite. Typically, an intermittent duff layer of needles, twigs, and branches about 1.5 inches thick is on the surface. The surface layer is pinkish gray, pale brown, and very pale brown silt loam 11 inches thick. The upper 6 inches of the subsoil is 75 percent light yellowish brown gravelly silty clay and 25 percent very pale brown silt loam. The next 14 inches of the subsoil is pale brown and light yellowish brown gravelly silty clay, and the lower part to a depth of 60 inches or more is light yellowish brown very cobbly silty clay.

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

This unit is used for timber production and grazing.

The potential natural plant community on this unit is mainly an overstory of subalpine fir on the Harkness and Mikesell soils and Douglas-fir on the Sedgway soil and an understory dominated by pine reedgrass on all three soils.

Subalpine fir, lodgepole pine, and Douglas-fir are the main woodland species on the Harkness and Mikesell soils (fig. 5). Douglas-fir is the main woodland species on the Sedgway soil. On the basis of a 100-year site curve, the average site index for lodgepole pine is 80 on the Harkness soil and 90 on the Mikesell soil. On the basis of a 50-year site curve, the average site index for Douglas-fir is 70 on the Harkness soil, 65 on the Sedgway soil, and 75 on the Mikesell soil. Yield tables indicate that the maximum average annual growth of

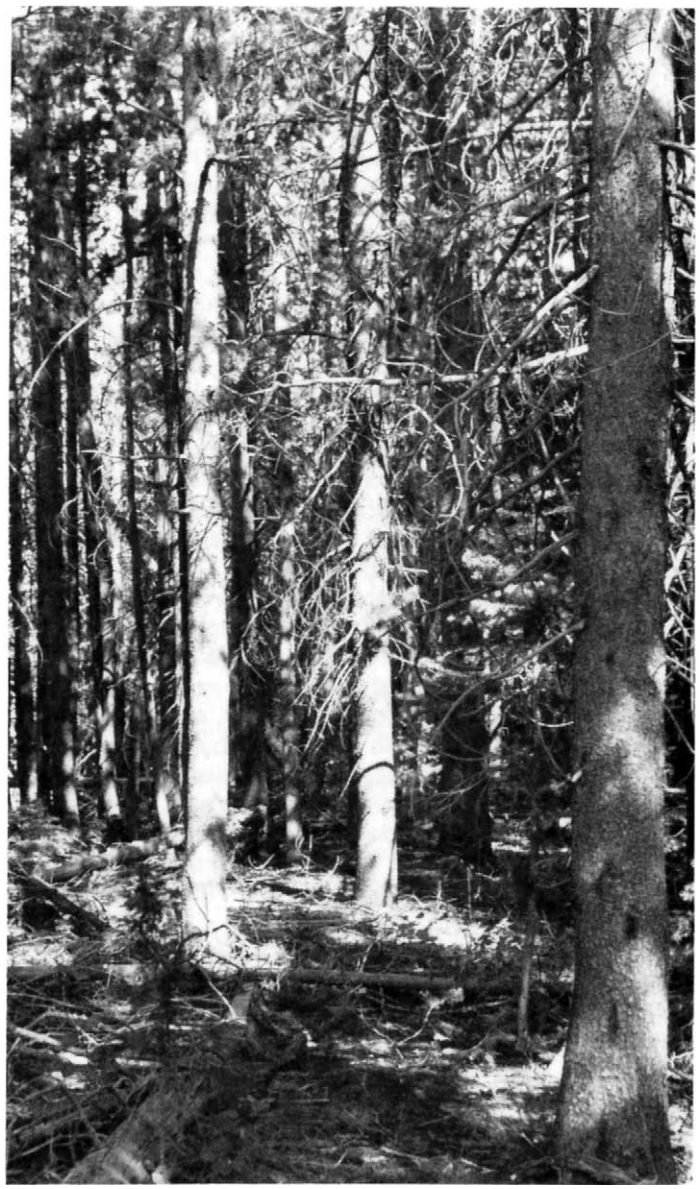


Figure 5.—Stand of lodgepole pine on Harkness silt loam in an area of Harkness-Sedgway-Mikesell complex, 20 to 50 percent slopes.

lodgepole pine at 100 years of age is 69 cubic feet per acre on the Harkness soil and 79 cubic feet per acre on the Mikesell soil. Yield tables indicate that the maximum average annual growth of Douglas-fir at 40 years of age is 96 cubic feet per acre on the Harkness soil, 85 cubic feet per acre on the Sedgway soil, and 104 cubic feet per acre on the Mikesell soil.

The main concerns in producing and harvesting timber are the hazard of water erosion, slope, and the hazard of plant competition. Minimizing the risk of erosion is essential in harvesting timber. Excessive erosion is avoided by carefully planning the construction and

maintenance of logging roads, skid trails, and landings. Cuts and fills should be seeded, and water bars and culverts should be installed. The steepness of slope limits the kinds of equipment that can be used for harvesting timber. If the site is not adequately prepared, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees.

This unit is suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 30 to 60 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth. Use of forage by livestock in some areas of this unit is limited because of the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas.

Livestock and wildlife concentrate in the included areas of very deep, poorly drained and somewhat poorly drained soils in this unit. These areas provide access to water, and they produce the more palatable vegetation when not overused. If economical, these areas should be managed using a deferred grazing system. It is likely that many of these areas will be considered sacrifice areas when developing an overall grazing plan.

This map unit is in capability subclass VIIe, nonirrigated.

52—Holmes gravelly loam, 1 to 4 percent slopes. This very deep, well drained soil is on stream terraces. It formed in mixed alluvium derived dominantly from sedimentary and metasedimentary rock. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 5,400 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 85 days.

Typically, the surface layer is dark grayish brown and dark brown gravelly loam 8 inches thick. The upper 8 inches of the subsoil is dark yellowish brown very gravelly loam, and the lower 12 inches is yellowish brown very gravelly loam. The substratum to a depth of 60 inches or more is multicolored extremely gravelly loamy coarse sand.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Hades gravelly silt loam in slightly concave areas, about 5 percent is Arbone gravelly silt loam in slightly convex areas, and about 5 percent is Hondoho gravelly silt loam in convex areas and on terrace breaks. The remaining 5 percent is small areas of a soil that is similar to this Holmes soil but has sand and gravel at a depth of 10 to 20 inches and soils that have slopes of less than 1 percent or more than 4 percent.

Permeability of this Holmes soil is moderate to a depth of 28 inches and rapid below this depth. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

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

This unit is suited to nonirrigated crops. It is limited mainly by the low available water capacity. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Also, waterways should be shaped and seeded to perennial grass.

This unit is suited to irrigated crops. It is limited mainly by the low available water capacity. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Because the soil in this unit is droughty, applications of irrigation water should be light and frequent. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The suitability of this unit for rangeland seeding is good.

This map unit is in capability subclass IVs, irrigated and nonirrigated.

53—Hondoho-Arbone complex, 4 to 12 percent slopes. This map unit is on mountain foot slopes and fan terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,500 to 5,500 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

This unit is about 45 percent Hondoho gravelly silt loam and about 40 percent Arbone gravelly silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is soils that are similar to the Hondoho soil but are subject to flash flooding and about 5 percent is soils that are similar to the Hondoho and Arbone soils but have slopes of more than 12 percent. The remaining 5 percent is small areas of Ririe silt loam, volcanic ash outcrops, and Trailcreek very fine sandy loam.

The Hondoho soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown gravelly silt loam 8 inches thick. The subsoil is brown, calcareous gravelly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very gravelly silt loam.

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

The Arbone soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown gravelly silt loam 9 inches thick. The subsoil is brown and pale brown, calcareous gravelly silt loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown, calcareous gravelly silt loam.

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

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

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. This unit is suited to the use of mechanical equipment such as rangeland plows and drills. The main limitation is the high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by low precipitation and the high hazard of water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Special designs for terraces are needed because of the shallow depth to moderately alkaline and strongly alkaline soil material. Bringing this material to the surface reduces the production of crops. Erosion can be reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining at least 1,500 pounds of straw per acre on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This map unit is in capability subclass IIIe.

54—Hondoho-Arbone-Ririe complex, 20 to 50 percent slopes. This map unit is on terrace breaks along major drainageways. The native vegetation is mainly shrubs and grasses. Elevation is about 4,600 to 6,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

This unit is about 45 percent Hondoho cobbly silt loam, about 20 percent Arbone gravelly silt loam, and about 15 percent Ririe silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Lanoak silt loam on north-facing side slopes, about 5 percent is soils that have slopes of less than 20 percent, and about 5 percent is Camelback extremely stony silt loam. The remaining 5 percent is small areas of Cedarhill very cobbly silt loam, Watercanyon silt loam, volcanic ash outcrops, and Trailcreek very fine sandy loam.

The Hondoho soil is very deep and well drained. It formed in alluvium derived from mixed sources. Slope is 20 to 50 percent. Typically, the surface layer is grayish brown cobbly silt loam 8 inches thick. The subsoil is brown, calcareous cobbly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very cobbly loam.

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

The Arbone soil is very deep and well drained. It formed in alluvium derived from mixed sources. Slope is 20 to 30 percent. Typically, the surface layer is grayish brown gravelly silt loam 9 inches thick. The subsoil is brown and pale brown, calcareous gravelly silt loam 9 inches thick. The substratum to a depth of 60 inches or more is very pale brown, calcareous gravelly silt loam.

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

The Ririe soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Slope is 20 to 50 percent. Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

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

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited

by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the cobbly surface of the Hondoho soil and the steepness of slope.

This map unit is in capability subclass VIIe.

55—Hondoho-Hades complex, 4 to 12 percent slopes. This map unit is on foothills and terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,800 to 5,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 80 days.

This unit is about 50 percent Hondoho cobbly silt loam and about 30 percent Hades gravelly silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Cedarhill very cobbly silt loam, high precipitation, on convex, south- and west-facing side slopes and near ridgetops; about 5 percent is Oxford silty clay loam on convex side slopes; and about 5 percent is Camelback very cobbly silt loam on convex ridges and side slopes. The remaining 5 percent is small areas of Bancroft silt loam and soils that have slopes of less than 4 percent or more than 12 percent.

The Hondoho soil is very deep and well drained. It formed in mixed alluvium. Typically, the surface layer is grayish brown cobbly silt loam 8 inches thick. The subsoil is brown, calcareous cobbly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very cobbly sandy clay loam.

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

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

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

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by the cobbly surface of the Hondoho soil and the high hazard of water erosion. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Erosion can be reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. The cobbly surface of the Hondoho soil and the very cobbly surface of the included Cedarhill and Camelback soils may hinder the use of machinery.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. This unit is not well suited to the use of mechanical equipment such as rangeland plows and drills. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass IVe.

56—Hondoho-Lanoak-Camelback complex, 20 to 50 percent slopes. This map unit is on side slopes along major drainageways that deeply dissect fan terraces. The native vegetation is mainly shrubs and grasses. Elevation is about 5,000 to 6,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 85 days.

This unit is about 45 percent Hondoho cobbly silt loam, about 20 percent Lanoak silt loam, and about 20 percent Camelback gravelly silt loam. The Hondoho soil is on south- and west-facing side slopes, the Lanoak soil is on concave, north- and east-facing side slopes, and the Camelback soil is on convex, north- and east-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Ririe silt loam on the lower part of south- and west-facing side slopes and about 5 percent is Moonlight silt loam in concave areas of north- and east-facing side slopes. The remaining 5 percent is small areas of Rock outcrop; Valmar very cobbly silt loam, low precipitation; Camelback very cobbly silt loam; soils that have slopes of less than 20 percent or more than 50 percent; and very deep soils that are along drainageways.

The Hondoho soil is very deep and well drained. It formed in mixed alluvium. Typically, the surface layer is grayish brown cobbly silt loam 8 inches thick. The subsoil is brown, calcareous cobbly silt loam 7 inches

thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very cobbly loam.

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

The Lanoak soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

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

The Camelback soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from sedimentary and metasedimentary rock. Typically, the surface layer is dark brown gravelly silt loam 21 inches thick. The upper 9 inches of the subsoil is dark brown extremely cobbly silt loam, and the lower part to a depth of 60 inches or more is yellowish brown extremely cobbly silt loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass and mountain big sagebrush. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope and the very high hazard of water erosion.

This map unit is in capability subclass VIIe.

57—Inkom silt loam, 0 to 1 percent slopes. This very deep, poorly drained soil is on stream terraces and flood plains. It formed in silty alluvium derived from mixed sources. The vegetation in areas not cultivated is mainly grasses and sedges. Elevation is about 4,500 to 5,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is grayish brown, calcareous silt loam 7 inches thick. The subsoil to a depth of 60 inches or more is gray, grayish brown, and light gray, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Inkom silt loam, drained, in the slightly higher areas that have better drainage and about 5 percent is a soil that is similar to this Inkom soil but is loam and sandy loam. The remaining 5 percent is small areas of Hondoho cobbly silt loam, Bear Lake silt loam, and soils that are similar to this Inkom soil but are not calcareous.

Permeability of this Inkom soil is moderate. Available water capacity is high. Effective rooting depth for plants, except those that are water tolerant, is limited by a seasonal high water table that is at a depth of 0 to 2 feet from February through June. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to frequent flooding for brief periods from January through June.

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

This unit is poorly suited to nonirrigated crops. It is used for the production of wheat and barley. The main limitations are frequent flooding and the high water table late in winter and in spring. The risk of flooding can be reduced by the use of dikes along the Portneuf River. Most climatically adapted crops can be grown if artificial drainage is provided.

This unit is well suited to pasture. The main limitations are the hazard of flooding and wetness. The potential natural plant community on this unit is mainly slender wheatgrass and sedges. If the plant cover is disturbed, protection from flooding is needed to control gullying, streambank cutting, and sheet erosion. Plants that tolerate wetness should be seeded. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock.

This map unit is in capability subclass IVw.

58—Inkom silt loam, drained, 0 to 1 percent slopes. This very deep, moderately well drained soil is on stream terraces and flood plains. It formed in silty alluvium derived from mixed sources. The drainage of this unit has been altered either by natural downcutting of streams or by dredging and straightening of stream channels. Elevation is about 4,500 to 5,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is grayish brown, calcareous silt loam 7 inches thick. The subsoil to a depth of 60 inches or more is gray, grayish brown, and light gray, calcareous silt loam.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Joevar silt loam in well drained areas along the edges of this unit; about 5 percent is Arbone gravelly silt loam and about 5 percent is Wursten gravelly silt loam, both of which are at the mouth of lateral drainageways. The remaining 5 percent is small areas of Hondoho cobbly

silt loam, Bear Lake silt loam, Downata silt loam, soils that are similar to this Inkom soil but are underlain by sand and gravel at a depth of 15 to 40 inches, and soils that are similar to this Inkom soil but are not calcareous.

Permeability of this Inkom soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. A seasonal high water table is at a depth of 2 to 4 feet from February through June. In both irrigated and nonirrigated areas, runoff is slow and the hazard of water erosion is slight. This soil is subject to occasional flooding for brief periods from January through June.

Most areas of this unit are used as irrigated and nonirrigated cropland. A few areas are used for homesite and urban development.

This unit is well suited to irrigated crops. It is used for the production of wheat, barley, and alfalfa hay. The main limitation is occasional flooding during spring runoff or summer storms. Sprinkler irrigation is a suitable method of applying water. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is well suited to nonirrigated crops. It is used for the production of wheat, barley, and alfalfa hay. The main limitations are low precipitation and occasional flooding during spring runoff or summer storms. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is poorly suited to homesite and urban development. The main limitations are the seasonal high water table and occasional flooding. The seasonal high water table may cause failure of septic tank absorption fields. Specially designed waste disposal systems are needed. Roads and streets should be located above the expected flood level. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding.

This map unit is in capability subclass IIIw, irrigated and nonirrigated.

59—Ireland-Camelback-Rock outcrop complex, 30 to 60 percent slopes. This map unit is on mountainsides and ridges. The native vegetation is mainly shrubs and grasses. Elevation is about 5,500 to 7,500 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days.

This unit is about 40 percent Ireland extremely stony silt loam, about 30 percent Camelback very cobbly silt loam, and about 15 percent Rock outcrop. The Ireland soil is on convex mountainsides and ridges, the Camelback soil is on slightly concave, north- and east-facing side slopes, and Rock outcrop is on ridgetops and the upper part of side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Moonlight silt loam on concave, north- and east-facing side slopes and about 5 percent is Cedarhill very cobbly silt loam on south-facing side slopes. The remaining 5 percent is small areas of Pavohroo silt loam, Greys silt loam, and Dateman cobbly silt loam, and very deep soils along drainageways.

The Ireland soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from dolomite and limestone. Typically, the surface layer is brown extremely stony silt loam 7 inches thick. The upper 5 inches of the subsoil is brown very stony silt loam, and the lower 18 inches is brown, calcareous extremely stony silt loam. Interbedded dolomite and limestone are at a depth of 30 inches. Depth to bedrock ranges from 20 to 40 inches.

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

The Camelback soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from sedimentary and metasedimentary rock. Typically, the surface layer is dark brown very cobbly silt loam 21 inches thick. The subsoil is dark brown and yellowish brown extremely cobbly silt loam 21 inches thick. Bedrock is at a depth of 42 inches. Depth to bedrock ranges from 40 to 60 inches.

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

Rock outcrop consists of areas of exposed interbedded dolomite, limestone, and quartzite. It is dominantly on ridgetops, but in some areas it consists of vertical cliffs. The cliffs generally are on the upper part of mountainsides.

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the Ireland soil is mainly bluebunch wheatgrass, curlleaf mountainmahogany, and mountain big sagebrush. The potential natural plant community on the Camelback soil is mainly bluebunch wheatgrass and mountain big sagebrush. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope, the areas of Rock outcrop, and the extremely stony surface of the Ireland soil.

This map unit is in capability subclass VIIs.

60—Ireland-Dateman-Pavohroo association, 20 to 60 percent slopes. This map unit is on mountainsides. Elevation is about 6,000 to 8,000 feet.

This unit is about 35 percent Ireland extremely stony silt loam, about 20 percent Dateman cobbly silt loam, and about 20 percent Pavohroo silt loam. The Ireland soil is on convex, south- and west-facing side slopes, the Dateman soil is on north- and east-facing, convex side slopes, and the Pavohroo soil is in concave areas on north- and east-facing side slopes.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is soils that are similar to the Ireland soil but are less than 20 inches deep to bedrock and are on the upper part of convex, south- and west-facing side slopes and on ridgetops, about 5 percent is soils that are similar to the Dateman soil but have more than 35 percent clay in the subsoil and are on north- and east-facing side slopes, and about 5 percent is a very deep soil in drainageways. The remaining 5 percent is small areas of Rock outcrop, Greys silt loam, and soils that have slopes of less than 20 percent.

The Ireland soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from dolomite and limestone. The native vegetation is mainly small trees, shrubs, and grasses. The average annual precipitation is about 18 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days. Typically, the surface layer is brown extremely stony silt loam 7 inches thick. The upper 5 inches of the subsoil is brown very stony silt loam, and the lower 18 inches is brown, calcareous extremely stony silt loam. Bedrock is at a depth of 30 inches. Depth to bedrock ranges from 20 to 40 inches.

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

The Dateman soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from dolomite and limestone. The native vegetation is mainly trees, shrubs, and grasses. The average annual precipitation is about 23 inches, the average annual air temperature is about 39 degrees F, and the average frost-free period is about 50 days. Typically, an intermittent duff layer of needles, twigs, and grasses about 2 inches thick is on the surface. The surface layer is dark grayish brown cobbly silt loam 9 inches thick. The subsoil is brown and yellowish brown extremely cobbly silt loam 26 inches thick. Bedrock is at a depth of 35 inches. Depth to bedrock ranges from 30 to 40 inches.

Permeability of the Dateman soil is moderate. Available water capacity is low. Effective rooting depth is 30 to 40 inches. Runoff is very rapid, and the hazard of water erosion is very high.

The Pavohroo soil is very deep and well drained. It formed in silty alluvium and colluvium derived from loess, dolomite, and limestone. The native vegetation is mainly trees, shrubs, and grasses. The average annual precipitation is about 25 inches, the average annual air temperature is about 38 degrees F, and the average frost-free period is about 40 days. Typically, an intermittent duff layer of needles, leaves, and twigs about 3 inches thick is on the surface. The surface layer is dark grayish brown silt loam 26 inches thick. The subsoil to a depth of 60 inches or more is pale brown stony loam.

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

This unit is used as rangeland, grazeable woodland, and woodland.

The potential natural plant community on the Ireland soil is mainly curlleaf mountainmahogany, mountain big sagebrush, and bluebunch wheatgrass. The potential natural plant community on the Dateman and Pavohroo soils is mainly an overstory of Douglas-fir and an understory dominated by mountain snowberry and pine reedgrass.

This Ireland soil is suited to use as rangeland. It is limited mainly by the extremely stony surface layer, the steepness of slope, and the very high hazard of water erosion. Use of forage by livestock in some areas of this soil is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on this soil because of the extremely stony surface layer, the steepness of slope, and the very high hazard of water erosion.

The Dateman and Pavohroo soils are suited to the production of understory plants suitable for grazing. They can produce additional forage for livestock and wildlife for 15 to 30 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 200 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

The Dateman soil is suited to the production of Douglas-fir. On the basis of a 50-year site curve, the average site index for Douglas-fir is 60. Yield tables indicate that the maximum average annual growth is 69 cubic feet per acre of Douglas-fir at 40 years of age. The main concerns in producing and harvesting timber are the very high hazard of water erosion, the steepness of slope, and the hazard of plant competition. Minimizing the risk of erosion is essential in harvesting timber.

Excessive erosion is avoided by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Cuts and fills should be seeded, and water bars and culverts should be installed. The steepness of slope limits the kinds of equipment that can be used for harvesting timber. If the overstory canopy is removed, the soil temperature increases. This may hinder the regeneration of timber. Competition from quaking aspen, shrubs, and grasses may also hinder regeneration. If the site is not adequately prepared, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees.

The Pavohroo soil is well suited to the production of Douglas-fir (fig. 6). On the basis of a 50-year site curve, the average site index for Douglas-fir is 65. Yield tables indicate that the maximum average annual growth is 85 cubic feet per acre of Douglas-fir at 40 years of age. The main concerns in producing and harvesting timber are the very high hazard of water erosion, the steepness of slope, and plant competition. Minimizing the risk of erosion is essential in harvesting timber. Excessive erosion is avoided by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Cuts and fills should be seeded, and water bars and culverts should be installed. The steepness of slope limits the kinds of equipment that can be used for harvesting timber. If the overstory canopy is removed, the soil temperature increases. This may hinder the regeneration of timber. Competition from quaking aspen, shrubs, and grasses may also hinder regeneration. If the site is not adequately prepared, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees.

The Ireland soil is in capability subclass VIIs, and the Dateman and Pavohroo soils are in capability subclass VIIe.

61—Ireland-Hades-Cedarhill complex, 20 to 60 percent slopes. This map unit is on mountainsides and ridges. The native vegetation is mainly small trees, shrubs, and grasses. Elevation is about 5,500 to 6,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 75 days.

This unit is about 35 percent Ireland extremely stony silt loam, about 30 percent Hades gravelly silt loam, and about 20 percent Cedarhill very cobbly silt loam. The Ireland soil is on dominantly south- and west-facing, convex side slopes of mountains, the Hades soil is on slightly concave, north- and east-facing side slopes, and the Cedarhill soil is dominantly on the lower part of south- and west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 10 percent is Moonlight silt loam near drainageways on concave, north- and east-facing side slopes. The remaining 5 percent is small areas of Rock outcrop, soils that are similar to this Ireland soil but are less than 20 inches deep to bedrock, Pavohroo silt loam, Rexburg silt loam, soils that are similar to the Hades soil but are in drainageways, and soils that have slopes of less than 20 percent or more than 60 percent.

The Ireland soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from dolomite and limestone. Slope is 30 to 60 percent. Typically, the surface layer is brown extremely stony silt loam 7 inches thick. The upper 5 inches of the subsoil is brown very stony silt loam, and the lower 18 inches is brown, calcareous extremely stony silt loam. Interbedded dolomite and limestone are at a depth of 30 inches. Depth to bedrock ranges from 20 to 40 inches.

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

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and other related sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

The Ireland and Hades soils are used as rangeland. The Cedarhill soil is used as grazeable woodland and woodland.

This unit is suited to use as rangeland and grazeable woodland. The potential natural plant community on the Ireland soil is mainly bluebunch wheatgrass, curlleaf mountainmahogany, and mountain big sagebrush. The potential natural plant community on the Hades soil is mainly bluebunch wheatgrass and mountain big

Figure 6.—Douglas-fir on Pavohroo silt loam in an area of Ireland-Dateman-Pavohroo association, 20 to 60 percent slopes.

sagebrush. The potential natural plant community on the Cedarhill soil is mainly bluebunch wheatgrass, Indian ricegrass, and Utah juniper. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope, the extremely stony surface of the Ireland soil, and the very cobbly surface of the Cedarhill soil.

In a few areas of the Cedarhill soil, some Utah juniper is cut for fenceposts and firewood. On the basis of a basal area attained when the diameter of trees at a height of 1 foot averages 5 inches, the average site index for Utah juniper is 105. Yield tables indicate that the maximum average annual growth is 31 cubic feet per acre of Utah juniper at 100 years of age.

This map unit is in capability subclass VIIe.

62—Joes silt loam, 1 to 4 percent slopes. This very deep, well drained soil is on fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,500 to 6,000 feet. The average annual precipitation is about 14 inches, the

average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is dark grayish brown, calcareous silt loam 6 inches thick. The subsoil is grayish brown, calcareous silt loam 7 inches thick. The substratum to a depth of 60 inches or more is very pale brown, light yellowish brown, and pale brown, calcareous silt loam.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 10 percent is Hondoho cobbly silt loam on convex side slopes along drainageways and about 5 percent is Watercanyon silt loam on south- and west-facing, convex side slopes and on eroded ridges. The remaining 5 percent is small areas of Lanoak silt loam and soils that have slopes of more than 4 percent.

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

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

The unit is well suited to use as nonirrigated cropland. It is used for the production of wheat and barley. It is limited mainly by low precipitation and the hazard of water erosion. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are performed on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

The unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

The unit is well suited to use as rangeland. The potential natural plant community is mainly mountain big sagebrush and bluebunch wheatgrass. The suitability of this unit for rangeland seeding is good.

This map unit is in capability subclass IIIc.

63—Joes silt loam, 4 to 12 percent slopes. This very deep, well drained soil is on fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,500 to 6,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is dark grayish brown, calcareous silt loam 6 inches thick. The subsoil is grayish brown, calcareous silt loam 7 inches thick. The substratum to a depth of 60 inches or more is very pale brown, light yellowish brown, and pale brown, calcareous silt loam.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 10 percent is Hondoho cobbly silt loam on convex side slopes along drainageways and about 5 percent is Lanoak silt loam on short, concave, north- and east-facing side slopes. The remaining 5 percent is small areas of Watercanyon silt loam and soils that have slopes of less than 4 percent or more than 12 percent.

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

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

The unit is well suited to use as nonirrigated cropland. It is used for the production of wheat and barley. It is limited mainly by low precipitation and the high hazard of water erosion. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

The unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

The unit is well suited to use as rangeland. The potential natural plant community on this Joes soil is mainly mountain big sagebrush and bluebunch wheatgrass. It has few limitations. The unit is suited to the use of mechanical equipment such as rangeland plows and drills.

This map unit is in capability subclass IIIe.

64—Joevar silt loam, 0 to 3 percent slopes. This very deep, well drained soil is on terraces. It formed in silty alluvium derived dominantly from loess. The vegetation in areas not cultivated is mainly shrubs and

grasses. Elevation is about 4,500 to 5,400 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is brown, calcareous silt loam 10 inches thick. The subsoil is brown, calcareous silt loam 23 inches thick. The next layer to a depth of 60 inches or more is a buried subsoil of pale brown, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Hondoho cobbly silt loam near drainageways and about 5 percent is Inkom silt loam in concave areas. The remaining 5 percent is small areas of Arbone silt loam, Arimo silt loam, and soils that are similar to this Joevar soil but have a weakly cemented pan at a depth of 15 to 30 inches.

Permeability of this Joevar soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. In both irrigated and nonirrigated areas, runoff is slow and the hazard of water erosion is slight.

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

This unit is well suited to irrigated crops. It is used for the production of wheat, barley, and alfalfa hay. It has few limitations. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Crop residue left on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is well suited to nonirrigated crops. It is limited mainly by low precipitation. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass, basin big sagebrush, and Nevada bluegrass. The suitability of this unit for rangeland seeding is good.

This map unit is in capability subclass IIIc, irrigated and nonirrigated.

65—Lanoak silt loam, 1 to 4 percent slopes. This very deep, well drained soil is on terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,900 to 5,600 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 80 days.

Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Joevar silt loam in concave areas and along drainageways and about 5 percent is Hondoho gravelly silt loam in convex areas along drainageways. The remaining 5 percent is small areas of Arbone silt loam and soils that have slopes of less than 1 percent or more than 4 percent.

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

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

The Lanoak soil is well suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by the short growing season and the hazard of water erosion. In some years the growing season is shorter than normal, which significantly reduces yields of crops. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The suitability of this unit for rangeland seeding is good.

This map unit is in capability subclass IIIc.

66—Lanoak silt loam, 4 to 12 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,500 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 80 days.

Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Ririe silt loam on south- and west-facing side slopes and hilltops and about 5 percent is Hondoho gravelly silt loam on side slopes along drainageways. The remaining 5 percent is small areas of Coalbank very fine sandy loam and soils that have slopes of less than 4 percent or more than 12 percent.

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

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

This unit is well suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by the high hazard of water erosion and the short growing season. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Erosion can be reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the growing season is shorter than normal, which significantly reduces yields of crops on the unit.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The unit is suited to the use of mechanical equipment such as rangeland plows and drills.

This map unit is in capability subclass IIIe.

67—Lanoak silt loam, 12 to 20 percent slopes. This very deep, well drained soil is on north- and east-facing side slopes of foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,500 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 80 days.

Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Camelback gravelly silt loam on convex side slopes and about 5 percent is Hades gravelly silt loam along drainageways. The remaining 5 percent is small areas of Moonlight silt loam, Valmar very cobbly silt loam, Watercanyon silt loam, and soils that have slopes of less than 12 percent or more than 20 percent.

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

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

This unit is suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by the very high hazard of water erosion and the short growing season. Erosion can be reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the growing season is shorter than normal, which significantly reduces yields of crops.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. This unit is suited to the use of mechanical equipment such as rangeland plows and drills. The main limitation is the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass IVe.

68—Lanoak silt loam, 20 to 30 percent slopes. This very deep, well drained soil is on north- and east-facing side slopes of foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,500 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 80 days.

Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Camelback gravelly silt loam on convex side slopes and about 5 percent is Hades gravelly silt loam along drainageways. The remaining 5 percent is small areas of Moonlight silt loam, Pavohroo silt loam, Ririe silt loam, Watercanyon silt loam, and soils that have slopes of less than 20 percent or more than 30 percent.

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

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

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of mechanical equipment such as rangeland plows and drills is limited by the steepness of slope and the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This unit is poorly suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by the steepness of slope, the very high hazard of water erosion, and the short growing season. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. Seeding to permanent cover may be needed to reduce erosion. In some years the growing season is shorter than normal, which significantly reduces yields of crops.

This map unit is in capability subclass VIe.

69—Lanoak-Camelback complex, 20 to 50 percent slopes. This map unit is on mountainsides. The native vegetation is mainly shrubs and grasses. Elevation is about 5,200 to 6,200 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 85 days.

This unit is about 50 percent Lanoak silt loam and about 35 percent Camelback gravelly silt loam. The Lanoak soil is on north- and east-facing, slightly concave side slopes, and the Camelback soil is on north- and east-facing, convex side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 10 percent is Moonlight silt loam on concave, north- and east-facing side slopes. The remaining 5 percent is small areas of Valmar very cobbly silt loam and Rock outcrop.

The Lanoak soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

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

The Camelback soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived from sedimentary and metasedimentary rock. Typically, the surface layer is dark brown gravelly silt loam 21 inches thick. The subsoil is dark brown and yellowish brown extremely cobbly silt loam 21 inches thick. Bedrock is at a depth of 42 inches. Depth to bedrock ranges from 40 to 60 inches.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass and mountain big sagebrush. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope and the very high hazard of water erosion.

This map unit is in capability subclass VIIe.

70—Lanoak-Greys association, 4 to 12 percent slopes. This map unit is on foothills and fan terraces. Elevation is about 5,500 to 6,500 feet.

This unit is about 45 percent Lanoak silt loam and about 35 percent Greys silt loam. The Lanoak soil is on convex, south- and west-facing side slopes, and the Greys soil is on concave, north- and east-facing side slopes.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Camelback gravelly silt loam on the upper part of convex side slopes, about 5 percent is very deep soils in drainageways, and about 5 percent is soils that have slopes of less than 4 percent or more than 12 percent. The remaining 5 percent is small areas of Trailcreek very fine sandy loam and soils that are similar to the Greys soil but have more than 35 percent rock fragments in the profile.

The Lanoak soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. The average annual precipitation is about 18 inches, the average annual air temperature is about 42 degrees F, and the average growing season is about 80 days. Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

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

The Greys soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly trees and grasses. The average annual precipitation is about 20 inches, the average annual air temperature is about 40 degrees F, and the average growing season is about 70 days. Typically, an intermittent duff layer of leaves, twigs, and grasses about 3 inches thick is on the surface. The surface layer is dark grayish brown silt loam 8 inches thick. The upper 4 inches of the subsurface layer is light brownish gray silt loam, and the lower part to a depth of 19 inches is 60 percent light brownish gray silt loam and 40 percent brown silt loam. The subsoil to a depth of 60 inches or more is brown, light yellowish brown, and pale brown silt loam.

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

This unit is used as rangeland, grazeable woodland, and nonirrigated cropland. A few small areas of the Greys soil are used as woodland.

The potential natural plant community on the Lanoak soil is mainly mountain big sagebrush and bluebunch wheatgrass. The potential natural plant community on the Greys soil is mainly an overstory of quaking aspen and an understory dominated by pine reedgrass (fig. 7).

The Lanoak soil is well suited to use as rangeland. It has few limitations. The soil is suited to the use of mechanical equipment such as rangeland plows and drills. The potential of this soil for rangeland seeding is good.

The Greys soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 10 to 20 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

The Lanoak soil is well suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The soil is limited mainly by the high hazard of water erosion and the short growing season. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Erosion can be reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the frost-free period is shorter than normal, which significantly reduces yields of crops on this soil.

The Greys soil is suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The soil is limited mainly by the high hazard of water erosion, a short growing season, and cool soil temperatures. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the growing season is shorter than normal, which significantly reduces yields of crops. In spring, cool soil temperatures may retard seed germination and limit early plant growth.

The Greys soil is suited to the production of quaking aspen. On the basis of an 80-year site curve, the average site index for quaking aspen is 65. Yield tables indicate that the maximum average annual growth is 36 cubic feet per acre of quaking aspen at 80 years of age. Most of the aspen harvested is used as firewood.

The Lanoak soil is in capability subclass IIIe, and the Greys soil is in capability subclass IVe.

71—Lanoak-Greys association, 12 to 20 percent slopes. This map unit is on foothills and fan terraces. Elevation is about 5,500 to 6,600 feet.

This unit is about 45 percent Lanoak silt loam and about 30 percent Greys silt loam. The Lanoak soil is on convex, south- and west-facing side slopes, and the Greys soil is on concave, north- and east-facing side slopes.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is

Figure 7.—An overstory of quaking aspen and an understory dominated by pine reedgrass on Greys silt loam in an area of Lanoak-Greys association, 4 to 12 percent slopes.

Camelback cobbly silt loam on south-facing side slopes along drainageways and about 5 percent is Hades gravelly silt loam on north-facing side slopes along drainageways. The remaining 10 percent is small areas

of Manila silt loam, Watercanyon silt loam, Ririe silt loam, and soils that have slopes of less than 12 percent or more than 20 percent.

The Lanoak soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. The average annual precipitation is about 18 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 80 days. Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

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

The Greys soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly trees and grasses. The average annual precipitation is about 20 inches, the average annual air temperature is about 40 degrees F, and the average frost-free period is about 70 days. Typically, an intermittent duff layer of leaves, twigs, and grasses about 3 inches thick is on the surface. The surface layer is dark grayish brown silt loam 8 inches thick. The upper 4 inches of the subsurface layer is light brownish gray silt loam, and the lower part to a depth of 19 inches is 60 percent light brownish gray silt loam and 40 percent brown silt loam. The subsoil to a depth of 60 inches or more is brown, light yellowish brown, and pale brown silt loam.

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

This unit is used as rangeland, grazeable woodland, and nonirrigated cropland. A few small areas of the Greys soil are used as woodland.

The potential natural plant community on the Lanoak soil is mainly mountain big sagebrush and bluebunch wheatgrass. The potential natural plant community on the Greys soil is mainly an overstory of quaking aspen and an understory dominated by pine reedgrass.

The Lanoak soil is well suited to use as rangeland. It is suited to the use of mechanical equipment such as rangeland plows and drills. The main limitation is the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

The Greys soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 10 to 20 years after the canopy is opened by logging, fire, or some other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

The Lanoak soil is suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The soil is limited mainly by the very high hazard of water erosion and the short growing season. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the growing season is shorter than normal, which significantly reduces yields of crops on this soil.

The Greys soil is suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The soil is limited mainly by the very high hazard of water erosion, a short growing season, and cool soil temperatures. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the growing season is shorter than normal, which significantly reduces yields of crops. In spring, cool soil temperatures may retard seed germination and limit early plant growth.

The Greys soil is suited to the production of quaking aspen. On the basis of an 80-year site curve, the average site index for quaking aspen is 65. Yield tables indicate that the maximum average annual growth is 36 cubic feet per acre of quaking aspen at 80 years of age. Most of the aspen harvested is used as firewood.

This map unit is in capability subclass IVe.

72—Lanoak-Hades complex, 6 to 20 percent slopes. This map unit is on foothills and fan terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,500 to 6,500 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 80 days.

This unit is about 40 percent Lanoak silt loam and about 35 percent Hades gravelly silt loam. The components of this unit are so intricately intermingled

that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Valmar extremely stony silt loam on ridgetops and the upper part of side slopes, about 5 percent is Camelback very cobbly silt loam on convex side slopes, about 5 percent is Moonlight silt loam on concave, north- and east-facing side slopes, and about 5 percent is Greys silt loam on concave, north- and east-facing side slopes. The remaining 5 percent is small areas of Cedarhill gravelly silt loam, high precipitation; Coalbank very fine sandy loam; and Trailcreek very fine sandy loam.

The Lanoak soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

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

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

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

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass and mountain big sagebrush. This unit is suited to mechanical treatment. The main limitation is the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This unit is suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by the very high hazard of water erosion and the short growing season. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are performed on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. Areas that have slopes of more than 12 percent may need to be seeded to permanent cover to reduce erosion. In some years the growing season is shorter than normal, which significantly reduces yields of crops on this unit.

This map unit is in capability subclass IVe.

73—Lanoak-Watercanyon-Rexburg complex, 12 to 20 percent slopes. This map unit is on dissected fan terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,200 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 85 days.

This unit is about 50 percent Lanoak silt loam, about 20 percent Watercanyon silt loam, and about 15 percent Rexburg silt loam. The Lanoak soil is on north-facing, concave side slopes, the Watercanyon soil is on eroded ridges and convex, south-facing side slopes, and the Rexburg soil is on nearly plane slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Manila silt loam on north-facing side slopes and about 5 percent is Ririe silt loam on slightly eroded side slopes. The remaining 5 percent is small areas of Hondoho cobbly silt loam, Arbone gravelly silt loam, Greys silt loam, Camelback extremely stony silt loam, Moonlight silt loam, and soils that have slopes of less than 12 percent or more than 20 percent.

The Lanoak soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is dark grayish brown silt loam 22 inches thick. The subsoil is grayish brown and pale brown silt loam 22 inches thick. The substratum to a depth of 60 inches or more is light gray, calcareous silt loam.

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

The Watercanyon soil is very deep and well drained. It formed in loess and alluvium derived from loess. Typically, the surface layer is pale brown, calcareous silt loam 7 inches thick. The subsoil is pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, light gray, and very pale brown, calcareous silt loam.

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

The Rexburg soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is grayish brown silt loam 10 inches thick. The subsoil is grayish brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is pale brown and light gray, calcareous silt loam.

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

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

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by the very high hazard of water erosion and the short growing season. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the growing season is shorter than normal, which significantly reduces yields of crops on this unit.

The Watercanyon and Rexburg soils are very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. The potential natural plant community on the Lanoak and Rexburg soils is mainly mountain big sagebrush and bluebunch wheatgrass. The potential natural plant community on the Watercanyon soil is mainly Wyoming big sagebrush, bluebunch wheatgrass, and arrowleaf balsamroot. This unit is suited to the use of mechanical equipment such as rangeland plows and drills. The main limitation is the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass IVe.

74—Lava flows-McCarey-McCarey Variant complex, 1 to 8 percent slopes. This map unit is on basalt flows. The native vegetation is mainly shrubs and grasses. Elevation is about 4,500 to 4,800 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

This unit is about 40 percent Lava flows, about 25 percent McCarey silt loam, and about 20 percent McCarey Variant extremely stony silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is soils that are similar to the McCarey soil but are very deep and are in concave pockets where water collects in spring and about 5 percent is areas of Lava flows that are characterized by vertical cliffs and channels. The remaining 5 percent is small areas of gravel deposits and soils that have slopes of more than 8 percent.

Lava flows consists of exposed basalt that is highly fractured and contains many crevices. The vegetation is mostly moss and lichens. Included are some crevices that support serviceberry, mountain big sagebrush, Rocky Mountain maple, currant, and antelope bitterbrush.

The McCarey soil is moderately deep and well drained. It formed in silty alluvium and in material weathered from basalt. Typically, the surface layer is dark grayish brown and grayish brown silt loam 12 inches thick. The subsoil is brown silt loam 5 inches thick. The substratum is light gray, calcareous silt loam 11 inches thick over basalt. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the McCarey soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate.

The McCarey Variant soil is shallow and well drained. It formed in silty alluvium and in material weathered from basalt. Typically, the surface layer is brown extremely stony silt loam 8 inches thick. The subsoil is brown very stony silt loam 5 inches thick. Basalt is at a depth of 13 inches. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the McCarey Variant soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate.

This unit is used as rangeland. A small area in Indian Rocks State Park is used for recreation.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The main limitations are the extremely stony surface of the McCarey Variant soil and the areas of Lava flows. This unit is poorly suited to the use of mechanical equipment such as rangeland plows and drills. Nonmechanical treatment practices may be more suitable.

This unit is poorly suited to recreational development. It is limited mainly by depth to bedrock, the extremely stony surface of the McCarey Variant soil, and the areas of Lava flows.

This map unit is in capability subclass VIIs.

75—Manila-Bancroft complex, 6 to 15 percent slopes. This map unit is on fan terraces and mountain foot slopes. The native vegetation is mainly shrubs and grasses. Elevation is about 5,000 to 6,000 feet. The

average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 75 days.

This unit is about 50 percent Manila silt loam and about 30 percent Bancroft silt loam. The Manila soil is on slightly concave side slopes, and the Bancroft soil is on slightly convex side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Joes silt loam on eroded ridges, about 5 percent is Broadhead silt loam in concave areas on north-facing side slopes, and about 5 percent is Yago extremely stony silty clay loam on ridgetops and convex side slopes. The remaining 5 percent is small areas of Hades gravelly silt loam and Cedarhill very cobbly silt loam.

The Manila soil is very deep and well drained. It formed in alluvium derived from sedimentary and metasedimentary rock and loess. Typically, the upper part of the surface layer is grayish brown silt loam 7 inches thick and the lower part is grayish brown silty clay loam 8 inches thick. The subsoil is yellowish brown and dark brown silty clay and silty clay loam 33 inches thick. The substratum to a depth of 60 inches or more is pale brown and light yellowish brown, calcareous silt loam.

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

The Bancroft soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is brown silt loam 7 inches thick. The upper 30 inches of the subsoil is brown and yellowish brown silty clay loam, and the lower 4 inches is light yellowish brown, calcareous silt loam. The substratum to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

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

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

This unit is suited to nonirrigated crops. The main limitations are the high hazard of erosion and the short growing season. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are performed on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. Terraces reduce runoff and the risk of erosion and help to conserve moisture. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. In some years the growing season is shorter than normal, which significantly reduces yields of crops on this unit.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The unit is well suited to the use of mechanical equipment such as rangeland plows and drills.

This map unit is in capability subclass IIIe.

76—Manila-Cedarhill, high precipitation complex, 20 to 30 percent slopes. This map unit is on mountain foot slopes and foothills. The native vegetation is mainly shrubs and grasses. Elevation is about 5,000 to 6,300 feet. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days.

This unit is about 40 percent Manila silt loam and about 40 percent Cedarhill very cobbly silt loam, high precipitation. The Manila soil is in concave areas on north- and east-facing side slopes, and the Cedarhill soil is on ridgetops and on convex, south- and west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Ridgecrest extremely stony silt loam on ridgetops, about 5 percent is Hades gravelly silt loam, and about 5 percent is Bancroft silt loam. The remaining 5 percent is small areas of Ricrest gravelly silt loam, soils that have slopes of less than 20 percent or more than 30 percent, Trailcreek very fine sandy loam, and outcrops of volcanic ash.

The Manila soil is very deep and well drained. It formed in alluvium derived from sedimentary and metasedimentary rock and loess. Typically, the upper part of the surface layer is grayish brown silt loam 7 inches thick, and the lower part is grayish brown silty clay loam 8 inches thick. The subsoil is yellowish brown and dark brown silty clay and silty clay loam 33 inches thick. The substratum to a depth of 60 inches or more is pale brown and light yellowish brown, calcareous silt loam.

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

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and related sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very

cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

This unit is used as nonirrigated cropland and as rangeland.

This unit is poorly suited to nonirrigated crops. The main limitations are slope, the very high hazard of erosion, the short growing season, and the very cobbly surface of the Cedarhill soil. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. In some years the growing season is shorter than normal, which significantly reduces yields of crops on the unit. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. The steepness of slope and the very cobbly surface of the Cedarhill soil may affect the performance of machinery. Seeding to permanent cover may be needed to reduce erosion.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of mechanical equipment such as rangeland plows and drills is limited because of the steepness of slope and the very cobbly surface of the Cedarhill soil. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass VIe.

77—McDole-McDole Variant complex, 0 to 2 percent slopes. This map unit is on flood plains and low terraces. Elevation is about 4,400 to 4,500 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent McDole silt loam and about 35 percent McDole Variant silt loam. The McDole soil is on the low terraces, and the McDole Variant soil is on the flood plains. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Hondoho gravelly silt loam near the mouth of drainageways and about 5 percent is McDole Variant soils that are protected from flooding. The remaining 5 percent is small areas of Broxon silt loam, organic soils that are wet for prolonged periods, and soils that have slopes of more than 2 percent.

The McDole soil is very deep and well drained. It formed in alluvium derived dominantly from loess. Typically, the surface layer is brown, calcareous silt loam 21 inches thick. The underlying material to a depth of 60 inches or more is pale brown, calcareous silt loam.

Permeability of the McDole soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. This soil is subject to rare, brief periods of flooding late in winter and in spring.

The McDole Variant soil is very deep and well drained. It formed in alluvium derived dominantly from loess. Typically, the surface layer is grayish brown and dark grayish brown, calcareous silt loam 34 inches thick. The underlying material to a depth of 60 inches or more is pale brown, calcareous fine sandy loam.

Permeability of the McDole Variant soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. This soil is subject to occasional, brief periods of flooding late in winter and in spring.

This unit is used mainly as irrigated cropland. It is also used for homesite and urban development.

This unit is well suited to irrigated crops. It has few limitations. Sprinkler irrigation is a suitable method of applying water. To avoid overirrigating and leaching of plant nutrients, applications of irrigation water should be adjusted to the available water capacity, the water intake rate, and the crop needs.

This unit is poorly suited to homesite and urban development. The main limitations are the hazard of flooding and the hazard of frost action. Protection from flooding can be provided by the use of dikes or channels to divert the water. The hazard of frost action is a limitation in maintaining roads, streets, driveways, and sidewalks.

This map unit is in capability subclasses IIc, irrigated, and VIc, nonirrigated.

78—Moonlight silt loam, 30 to 60 percent slopes. This very deep, well drained soil is on concave, north- and east-facing mountainsides. It formed in alluvium derived from loess and from sedimentary and metasedimentary rock. The native vegetation is mainly tall shrubs. Elevation is about 5,000 to 7,500 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 38 degrees F, and the average frost-free period is about 55 days.

Typically, an intermittent duff layer of leaves, twigs, and grasses about 2 inches thick is on the surface. The surface layer is very dark grayish brown, dark grayish brown, and dark brown silt loam 24 inches thick. The subsoil to a depth of 60 inches or more is brown and light yellowish brown silt loam.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Greys silt loam on slightly concave or plane, north- and east-facing side slopes, about 5 percent is Camelback gravelly silt loam on convex, south- and west-facing side slopes, about 5 percent is very deep soils in drainageways, and about 5 percent is Pavohroo silt loam on concave, north- and east-facing side slopes at the higher elevations. The remaining 5 percent is small areas of Rock outcrop and soils that have slopes of less than 30 percent.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly Rocky Mountain maple, quaking aspen, common chokecherry, and mountain brome. Use of forage by livestock in some areas of this unit is limited by steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope and the very high hazard of water erosion.

This map unit is in capability subclass VIIe.

79—Moonlight-Camelback association, 30 to 60 percent slopes. This map unit is on mountainsides. The native vegetation is mainly small trees, shrubs, and grasses. Elevation is about 5,500 to 7,500 feet.

This unit is about 40 percent Moonlight silt loam and about 35 percent Camelback gravelly silt loam. The Moonlight soil is on concave, north- and east-facing side slopes near drainageways, and the Camelback soil is on convex and slightly concave side slopes that dominantly face south and west.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is very deep soils along drainageways, about 5 percent is Pavohroo silt loam in concave pockets, and about 5 percent is Rock outcrop and talus that can occur anywhere in the unit. The remaining 5 percent is small areas of Valmar very cobbly silt loam, Hades gravelly silt loam, Yago extremely stony silty clay loam, Lanoak silt loam, and soils that have slopes of less than 30 percent.

The Moonlight soil is very deep and well drained. It formed in alluvium derived from loess and from sedimentary and metasedimentary rock. The average annual precipitation is about 18 inches, the average annual air temperature is about 38 degrees F, and the average frost-free period is about 50 days. Typically, an intermittent duff layer of leaves, twigs, and grasses about 2 inches thick is on the surface. The surface layer is very dark grayish brown, dark grayish brown, and dark brown silt loam 24 inches thick. The subsoil to a depth of 60 inches or more is brown and light yellowish brown silt loam.

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

The Camelback soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from quartzite. The average annual precipitation is about 17 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days. Typically, the surface layer is dark brown gravelly silt loam 21 inches thick. The subsoil is dark brown and yellowish brown extremely cobbly silt loam 21 inches thick. Quartzite bedrock is at a depth of 42 inches. Depth to bedrock ranges from 40 to 60 inches.

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

This unit is used as rangeland.

This unit is well suited to use as rangeland. The potential natural plant community on the Moonlight soil is mainly Rocky Mountain maple, quaking aspen, common chokecherry, and mountain brome. The potential natural plant community on the Camelback soil is mainly bluebunch wheatgrass and mountain big sagebrush. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical because of the steepness of slope and the very high hazard of water erosion.

This map unit is in capability subclass VIIe.

80—Moonlight-Pavohroo complex, 30 to 60 percent slopes. This map unit is on mountainsides (fig. 8). The native vegetation is mainly trees, tall shrubs, and grasses. Elevation is about 5,500 to 7,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 39 degrees F, and the average frost-free period is about 50 days.

This unit is about 45 percent Moonlight silt loam and about 30 percent Pavohroo silt loam. The Moonlight soil is on concave, north- and east-facing side slopes, and the Pavohroo soil is in positions similar to those of the Moonlight soil but generally is at higher elevations. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Camelback gravelly silt loam on convex, south- and west-facing side slopes and about 10 percent is very

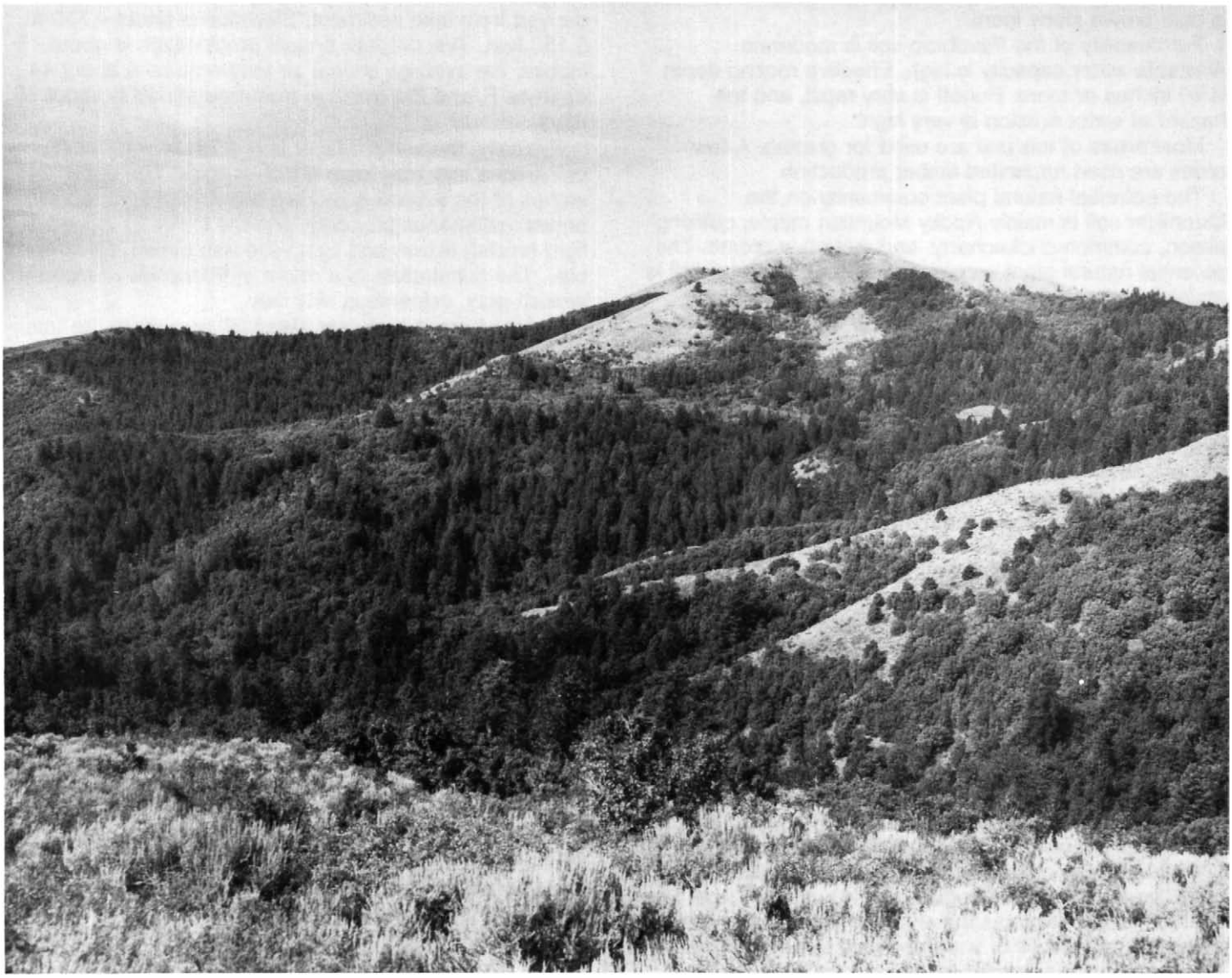


Figure 8.—Typical area of Moonlight-Pavohroo complex, 30 to 60 percent slopes. Valmar-Camelback-Hades complex, 30 to 60 percent slopes, is in foreground and on ridgetops.

deep soils along drainageways. The remaining 5 percent is small areas of Valmar very cobbly silt loam, Rock outcrop, and soils that have slopes of less than 30 percent.

The Moonlight soil is very deep and well drained. It formed in alluvium derived from loess and from sedimentary and metasedimentary rock. Typically, an intermittent duff layer of leaves, twigs, and grasses about 2 inches thick is on the surface. The surface layer is very dark grayish brown, dark grayish brown, and dark brown silt loam 24 inches thick. The subsoil to a depth of 60 inches or more is brown and light yellowish brown silt loam.

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

The Pavohroo soil is very deep and well drained. It formed in silty alluvium and colluvium derived from loess and various kinds of sedimentary and metasedimentary rock. Typically, an intermittent duff layer of needles, twigs, and leaves about 3 inches thick is on the surface. The surface layer is dark grayish brown silt loam 26

inches thick. The subsoil to a depth of 60 inches or more is pale brown stony loam.

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

Most areas of this unit are used for grazing. A few areas are used for limited timber production.

The potential natural plant community on the Moonlight soil is mainly Rocky Mountain maple, quaking aspen, common chokecherry, and mountain brome. The potential natural plant community on the Pavohroo soil is mainly an overstory of Douglas-fir and an understory dominated by mountain snowberry and pine reedgrass.

The Moonlight and Pavohroo soils are well suited to the production of understory plants suitable for grazing. The Pavohroo soil can produce additional forage for livestock and wildlife for 15 to 30 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 200 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth. Use of forage by livestock in some areas of this unit is limited because of the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope, the trees and tall shrubs, and the very high hazard of water erosion.

The Pavohroo soil is suited to the production of Douglas-fir. On the basis of a 50-year site curve, the average site index for Douglas-fir is 65. Yield tables indicate that the maximum average annual growth is 85 cubic feet per acre of Douglas-fir at 40 years of age. The main concerns in producing and harvesting timber are the very high hazard of water erosion, the steepness of slope, and plant competition. Minimizing the risk of erosion is essential in harvesting timber. Excessive erosion is avoided by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Cuts and fills should be seeded, and water bars and culverts should be installed. The steepness of slope limits the kinds of equipment that can be used for harvesting timber. If the overstory canopy is removed, the soil temperature increases. This may hinder the regeneration of timber. Competition from quaking aspen, shrubs, and grasses may also hinder regeneration. If the site is not adequately prepared, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees.

This map unit is in capability subclass VIIe.

81—Oxford silty clay loam, 4 to 12 percent slopes. This very deep, moderately well drained soil is on lake terraces. It formed in lake sediment and in alluvium derived from lake sediment. Elevation is about 4,750 to 5,150 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 95 days.

Typically, the surface layer is reddish brown, calcareous silty clay loam 5 inches thick. The upper 21 inches of the subsoil is reddish brown and light reddish brown, calcareous silty clay, and the lower 21 inches is light reddish brown and light yellowish brown, calcareous clay. The substratum to a depth of 60 inches or more is pinkish gray, calcareous silty clay.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 10 percent is Banida silty clay loam in concave areas and on north-facing side slopes and about 10 percent is a soil that is similar to this Oxford soil but has a silty clay surface layer and is on eroded ridges and convex side slopes.

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

This unit is used as nonirrigated cropland.

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by the high clay content of the surface layer and the high hazard of water erosion. The unit is difficult to till when it is dry, and it is subject to clodding and compaction if it is tilled when too moist. The period during which the soil moisture content is most suited to tillage is short. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Erosion is also reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration.

This map unit is in capability subclass IIIe.

82—Oxford-Banida complex, 2 to 4 percent slopes. This map unit is on lake terraces. Elevation is about 4,750 to 5,150 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 95 days.

This unit is about 50 percent Oxford silty clay loam and about 30 percent Banida silty clay loam. The Oxford soil is on convex side slopes and ridges, and the Banida soil is on slightly concave side slopes. The components

of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 10 percent is soils that are similar to the Banida soil but are in drainageways and in very concave areas and about 5 percent is Oxford and Banida soils that have slopes of less than 2 percent or more than 4 percent. The remaining 5 percent is small areas of Trailcreek very fine sandy loam and volcanic ash outcrops.

The Oxford soil is very deep and moderately well drained. It formed in lake sediment and in alluvium derived from lake sediment. Typically, the surface layer is reddish brown, calcareous silty clay loam 5 inches thick. The upper 21 inches of the subsoil is reddish brown and light reddish brown, calcareous silty clay, and the lower 21 inches is light reddish brown and light yellowish brown, calcareous clay. The substratum to a depth of 60 inches or more is pinkish gray, calcareous silty clay.

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

The Banida soil is very deep and moderately well drained. It formed in lake sediment and in alluvium derived from lake sediment. Typically, the upper 6 inches of the surface layer is brown silty clay loam and the lower 3 inches is brown silty clay. The upper 13 inches of the subsoil is reddish brown silty clay, and the lower 18 inches is reddish brown and light brown, calcareous silty clay. The substratum to a depth of 60 inches or more is light brown, calcareous silty clay.

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

This unit is used as nonirrigated cropland.

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by the high clay content of the surface layer and the hazard of water erosion. This unit is difficult to till when it is dry, and it is subject to clodding and compaction if it is tilled when too moist. The period during which the soil moisture content is most suited to tillage is short. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration.

This map unit is in capability subclass IIIe.

83—Pavohroo-Moonlight complex, 30 to 60 percent slopes. This map unit is on mountainsides. The native vegetation is mainly trees, tall shrubs, and grasses. Elevation is about 5,500 to 7,500 feet. The average annual precipitation is about 22 inches, the average annual air temperature is about 39 degrees F, and the average frost-free period is about 50 days.

This unit is about 55 percent Pavohroo silt loam and about 20 percent Moonlight silt loam. The Pavohroo soil is on concave, north- and east-facing side slopes near drainageways, and the Moonlight soil is in positions similar to those of the Pavohroo soil but is generally at lower elevations. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Sedgway gravelly silt loam in slightly concave areas on north- and east-facing side slopes, about 5 percent is Valmar very cobbly silt loam on convex side slopes and ridgetops, and about 5 percent is Camelback gravelly silt loam on convex, south- and west-facing side slopes. The remaining 5 percent is small areas of Rock outcrop, soils that have slopes of less than 30 percent, and very deep soils along drainageways.

The Pavohroo soil is very deep and well drained. It formed in silty alluvium and colluvium derived from loess and various kinds of sedimentary and metasedimentary rock. Typically, an intermittent duff layer of needles, leaves, and twigs about 3 inches thick is on the surface. The surface layer is dark grayish brown silt loam 26 inches thick. The subsoil to a depth of 60 inches or more is pale brown stony loam.

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

The Moonlight soil is very deep and well drained. It formed in loess and in alluvium derived from loess and sedimentary and metasedimentary rock. Typically, an intermittent duff layer of leaves, twigs, and grasses about 2 inches thick is on the surface. The surface layer is very dark grayish brown, dark grayish brown, and dark brown silt loam 24 inches thick. The subsoil to a depth of 60 inches or more is brown and light yellowish brown silt loam.

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

Most areas of this unit are used for grazing. A few areas are used for limited timber production.

The potential natural plant community on the Pavohroo soil is mainly an overstory of Douglas-fir and an understory dominated by mountain snowberry and pine reedgrass. The potential natural plant community on the Moonlight soil is mainly Rocky Mountain maple,

quaking aspen, common chokecherry, and mountain brome.

The Pavohroo soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 15 to 30 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 200 pounds per acre as the canopy closes. The Moonlight soil is also well suited to the production of understory plants suitable for grazing.

In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth. Use of forage by livestock in some areas of this unit is limited because of the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope, the trees and tall shrubs, and the very high hazard of water erosion.

The Pavohroo soil is suited to the production of Douglas-fir. On the basis of a 50-year site curve, the average site index for Douglas-fir is 65. Yield tables indicate that the maximum average annual growth is 85 cubic feet per acre of Douglas-fir at 40 years of age. The main concerns in producing and harvesting timber are the very high hazard of water erosion, the steepness of slope, and the hazard of plant competition. Minimizing the risk of erosion is essential in harvesting timber. Excessive erosion is avoided by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Cuts and fills should be seeded, and water bars and culverts should be installed. The steepness of slope limits the kinds of equipment that can be used for harvesting timber. If the overstory canopy is removed, the soil temperature increases. This may hinder the regeneration of timber. Competition from quaking aspen, shrubs, and grasses may also hinder regeneration. If the site is not adequately prepared, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees.

This map unit is in capability subclass VIIe.

84—Pavohroo-Sedgway-Toponce complex, 20 to 50 percent slopes. This map unit is on mountainsides. The native vegetation is mainly trees, shrubs, and grasses. Elevation is about 6,000 to 6,900 feet. The average annual precipitation is about 27 inches, the average annual air temperature is about 38 degrees F, and the average frost-free period is about 45 days.

This unit is about 30 percent Pavohroo silt loam, about 30 percent Sedgway gravelly silt loam, and about 20 percent Toponce silt loam. The Pavohroo soil is in slightly concave areas on north- and east-facing side slopes, the Sedgway soil is on slightly convex, north- and east-facing side slopes, and the Toponce soil is on the lower part of slightly convex to plane slopes that generally face south or west. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Camelback gravelly silt loam on convex, south- and west-facing side slopes, about 5 percent is Enochville and Enochville Variant soils that have slopes of less than 3 percent and are along drainageways, and about 5 percent is Valmar very cobbly silt loam on convex, south- and west-facing side slopes and ridges. The remaining 5 percent is small areas of soils that are similar to the Toponce soils but are more than 35 percent rock fragments, Beaverdam silt loam, volcanic ash outcrops, Rock outcrop, and soils that have slopes of less than 20 percent.

The Pavohroo soil is very deep and well drained. It formed in silty alluvium and colluvium derived from loess and various kinds of sedimentary and metasedimentary rock. Slope is 20 to 50 percent. Typically, an intermittent duff layer of needles, leaves, and twigs about 3 inches thick is on the surface. The surface layer is dark grayish brown silt loam 26 inches thick. The subsoil to a depth of 60 inches or more is pale brown stony loam.

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

The Sedgway soil is very deep and well drained. It formed in alluvium and colluvium derived from sedimentary and metasedimentary rock. Slope is 20 to 50 percent. Typically, an intermittent duff layer of needles, leaves, twigs, and grasses about 2 inches thick is on the surface. The upper 5 inches of the surface layer is very dark grayish brown gravelly silt loam, and the lower 7 inches is dark grayish brown very cobbly silt loam. The subsurface layer is pale brown very cobbly loam 9 inches thick. The upper 6 inches of the subsoil is 80 percent yellowish brown very cobbly clay loam and 20 percent pale brown very cobbly loam, and the lower part to a depth of 60 inches or more is yellowish brown very cobbly clay loam.

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

The Toponce soil is very deep and well drained. It formed in alluvium derived dominantly from sedimentary and metasedimentary rock. Slope is 20 to 30 percent. Typically, the upper 3 inches of the surface layer is dark grayish brown silt loam and the lower 11 inches is dark grayish brown silty clay loam. The subsoil to a depth of 60 inches or more is dark brown silty clay loam and brown silty clay and clay.

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

This unit is used as woodland and for grazing.

The potential natural plant community on the Pavohroo soil is mainly an overstory of Douglas-fir and an understory dominated by mountain snowberry and pine reedgrass. The potential natural plant community on the Sedgway soil is mainly an overstory of Douglas-fir and an understory dominated by pine reedgrass. The potential natural plant community on the Toponce soil is mainly an overstory of quaking aspen and an understory dominated by pine reedgrass.

The Pavohroo and Sedgway soils are well suited to the production of Douglas-fir. On the basis of a 50-year site curve, the average site index for Douglas-fir on these soils is 65. Yield tables indicate that the maximum average annual growth is 85 cubic feet per acre of Douglas-fir at 40 years of age. The main concerns in producing and harvesting timber are the very high hazard of water erosion, the steepness of slope, and the hazard of plant competition. Minimizing the risk of erosion is essential in harvesting timber. Excessive erosion is avoided by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Cuts and fills should be seeded, and water bars and culverts should be installed. The steepness of slope limits the kinds of equipment that can be used for harvesting timber. If the overstory canopy is removed, the soil temperature increases. This may hinder the regeneration of timber. Competition from quaking aspen, shrubs, and grasses may also hinder regeneration. If the site is not adequately prepared, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees.

The Toponce soil is suited to the production of quaking aspen. On the basis of an 80-year site curve, the average site index for quaking aspen is 65. Yield tables indicate that the maximum average annual growth is 36 cubic feet per acre of quaking aspen at 80 years of age. Most of the aspen harvested is used as firewood.

The Pavohroo soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 15 to 30 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 200 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth. Use of forage by livestock in some areas of this soil is limited because of the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas.

The Sedgway soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 15 to 30 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth. Use of forage by livestock in some areas of this soil is limited because of the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas.

The Toponce soil is well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 10 to 20 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

Livestock and wildlife concentrate in the included areas of Enochville and Enochville Variant soils in this unit. These areas provide access to water, and they produce the more palatable vegetation when not overused. If economically feasible, these areas should be managed using a deferred grazing system. It is likely that many of these areas will be considered sacrifice areas when developing an overall grazing plan.

This map unit is in capability subclass VIIe.

85—Pits, gravel. These are open excavations where the soil and part of the underlying sand, gravel, and cobbles have been removed. This unit generally is on terraces created by the ancient Bonneville Flood. The exposed underlying material supports very little if any vegetation. Some of these pits can be filled with water and used as fish ponds.

This map unit is in capability subclass VIIIs.

86—Pits, quarry. This map unit is primarily in the Inkom area. It is open pit excavations where the soil material has been removed and the underlying bedrock has been quarried. The limestone that has been removed is used primarily for making cement at the plant in Inkom. The quartzite that has been removed has been used as highway subgrade and for road surfacing. The material remaining is generally bedrock that supports very little if any vegetation.

This map unit is in capability subclass VIIIs.

87—Pocatello silt loam, 1 to 4 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The native vegetation is mainly shrubs and grasses. Elevation is about 4,400 to 5,200 feet. The average annual precipitation is about 11 inches, the

average annual air temperature is about 47 degrees F, and the average frost-free period is about 115 days.

Typically, the surface layer is grayish brown, calcareous silt loam 8 inches thick. The upper 32 inches of the underlying material is pale brown and very pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is pale brown, calcareous silt loam.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Broncho cobbly loam on convex side slopes along drainageways. The remaining 5 percent is small areas of Ririe silt loam and soils that have slopes of less than 1 percent or more than 4 percent.

Permeability of this Pocatello soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is moderate. If this soil is irrigated, runoff is medium and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for homesite and urban development, as irrigated and nonirrigated cropland, and as rangeland.

If this unit is used for homesite and urban development, the main limitations are the hazard of water erosion, the moderately alkaline and strongly alkaline underlying material, moderate permeability, and the hazard of frost action. The risk of erosion is increased if the soil is left exposed during site development. Erosion is controlled and maintenance costs reduced by stabilizing areas that have been disturbed. When excavations are made, lawns, shrubs, trees, and gardens may be difficult to establish if the underlying material is spread on the surface or is mixed with the surface layer. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. If the density of housing is moderate to high, community sewage systems are needed. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks.

This unit is well suited to irrigated crops. It is used for the production of wheat, barley, potatoes, and alfalfa hay. The unit is limited mainly by the high hazard of erosion. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content.

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by low precipitation and the moderate hazard of water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This soil is well suited to use as rangeland. It has few limitations. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. The unit is well suited to the use of mechanical equipment such as rangeland plows and drills. The suitability of the unit for rangeland seeding is good.

This map unit is in capability subclasses IIIe, irrigated, and IVe, nonirrigated.

88—Pocatello silt loam, 4 to 8 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The native vegetation is mainly shrubs and grasses. Elevation is about 4,400 to 5,200 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 115 days.

Typically, the surface layer is grayish brown, calcareous silt loam 8 inches thick. The upper 32 inches of the underlying material is pale brown and very pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is pale brown, calcareous silt loam.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Broncho cobbly loam on convex side slopes along drainageways. The remaining 5 percent is small areas of Ririe silt loam and soils that have slopes of less than 4 percent or more than 8 percent.

Permeability of this Pocatello soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. If this soil is irrigated, runoff is rapid and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used for homesite and urban development, as irrigated and nonirrigated cropland, and as rangeland.

If this unit is used for homesite and urban development, the main limitations are the hazard of water erosion, the moderately alkaline and strongly alkaline underlying material, moderate permeability, and the hazard of frost action. The risk of erosion is increased if the soil is left exposed during site development. Erosion is controlled and maintenance

costs reduced by stabilizing areas that have been disturbed. When excavations are made, lawns, shrubs, trees, and gardens may be difficult to establish if the underlying material is spread on the surface or is mixed with the surface layer. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. If the density of housing is moderate to high, community sewage systems are needed. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks.

This unit is suited to irrigated crops. It is used for the production of wheat, barley, potatoes, and alfalfa hay. The unit is limited mainly by the high hazard of erosion. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Erosion is reduced and fertility maintained by using a suitable cropping system, crop residue management, minimum tillage, and proper fertilization. All tillage should be on the contour or across the slope.

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by low precipitation and the moderate hazard of water erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Practices that can be used to control erosion include seeding early in fall, stubble mulch tillage, and construction of terraces, diversions, and grassed waterways. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Special designs for terraces and diversions are needed because of the shallow depth to moderately alkaline and strongly alkaline soil material. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. This unit is well suited to the use of mechanical equipment such as rangeland plows and drills. It is well suited to rangeland seeding.

This map unit is in capability subclass IVe, irrigated and nonirrigated.

89—Pocatello silt loam, 8 to 12 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The native vegetation is mainly shrubs and grasses. Elevation is about 4,400 to 5,200 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 115 days.

Typically, the surface layer is grayish brown, calcareous silt loam 8 inches thick. The upper 32 inches of the underlying material is pale brown and very pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is pale brown, calcareous silt loam.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Broncho cobbly loam on convex side slopes along drainageways. The remaining 5 percent is small areas of Ririe silt loam and soils that have slopes of less than 8 percent or more than 12 percent.

Permeability of this Pocatello soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. If this soil is irrigated, runoff is very rapid and the hazard of water erosion is very high. The hazard of soil blowing is slight.

This unit is used mainly for homesite and urban development. It is also used as irrigated and nonirrigated cropland and as rangeland.

Population growth has resulted in increased construction of homes on this unit. The main limitations are the hazard of water erosion, slope, the moderately alkaline and strongly alkaline underlying material, the hazard of frost action, and moderate permeability. The risk of erosion is increased if the soil is left exposed during site development. Erosion is controlled and maintenance costs reduced by stabilizing areas that have been disturbed. Access roads should be designed to provide adequate cut-slope grade, and drains are needed to control surface runoff and keep soil losses to a minimum. When excavations are made, lawns, shrubs, trees, and gardens may be difficult to establish if the underlying material is spread on the surface or is mixed with the surface layer. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. If the density of housing is moderate to high, community sewage systems are needed.

This unit is suited to irrigated crops. It is used for the production of wheat, barley, potatoes, and alfalfa hay. The unit is limited mainly by the very high hazard of erosion. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Erosion is reduced and fertility maintained by using a suitable cropping system, crop residue management,

minimum tillage, and proper fertilization. All tillage should be on the contour or across the slope.

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by low precipitation and the high hazard of erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Practices that can be used to control erosion include seeding early in fall, stubble mulch tillage, and construction of terraces, diversions, and grassed waterways. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Special designs for terraces and diversions are needed because of the shallow depth to moderately alkaline and strongly alkaline soil material. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. The suitability of this unit for rangeland seeding is good.

This map unit is in capability subclasses VIe, irrigated, and IVe, nonirrigated.

90—Pocatello silt loam, 12 to 20 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The native vegetation is mainly shrubs and grasses. Elevation is about 4,400 to 5,200 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 115 days.

Typically, the surface layer is grayish brown, calcareous silt loam 8 inches thick. The upper 32 inches of the underlying material is pale brown and very pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is pale brown, calcareous silt loam.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Broncho cobbly loam on convex side slopes along drainageways. The remaining 5 percent is small areas of Ririe silt loam and soils that have slopes of less than 12 percent or more than 20 percent.

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

Most areas of this unit are used as rangeland. A few areas are used as nonirrigated cropland and for homesite development.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. The unit is not well suited to mechanical treatment. The main limitation is the hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This unit is poorly suited to use as nonirrigated cropland. It is used for the production of wheat and barley. The unit is limited mainly by low precipitation and the very high hazard of erosion. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration.

This unit is suited to homesite development. The main limitations are slope, the hazard of water erosion, the moderately alkaline and strongly alkaline underlying material, and the hazard of frost action. Access roads should be designed to provide adequate cut-slope grade, and drains are needed to control surface runoff and keep soil losses to a minimum. Preserving the existing plant cover during construction helps to control erosion. The risk of erosion is increased if the soil is left exposed during site development. Erosion is controlled and maintenance costs reduced by stabilizing areas that have been disturbed. When excavations are made, lawns, shrubs, trees, and gardens may be difficult to establish if the underlying material is spread on the surface or is mixed with the surface layer. Topsoil can be stockpiled and used to reclaim areas disturbed during construction. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. Slope is a concern in installing septic tank absorption fields.

This map unit is in capability subclass IVe.

91—Pocatello silt loam, 20 to 30 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The native vegetation is mainly shrubs and grasses. Elevation is about 4,400 to 5,200 feet. The average annual precipitation is about 11 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 115 days.

Typically, the surface layer is grayish brown, calcareous silt loam 8 inches thick. The upper 32 inches

of the underlying material is pale brown and very pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is pale brown, calcareous silt loam.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Broncho cobbly loam on convex side slopes along drainageways. The remaining 5 percent is small areas of Ririe silt loam and soils that have slopes of less than 20 percent or more than 30 percent.

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

Most areas of this unit are used as rangeland. A few areas are used for homesite development.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. Use of mechanical equipment such as rangeland plows and drills is not practical because of the steepness of slope and the very high hazard of erosion. Nonmechanical treatment practices may be more suitable.

This unit is poorly suited to homesite development. It is limited mainly by the hazard of water erosion and slope. Excavation for roads and buildings increases the risk of erosion. Slope is a concern in installing septic tank absorption fields. Effluent from septic tank absorption fields can surface in downslope areas and thus create a hazard to health. Access roads should be designed to provide adequate cut-slope grade, and drains are needed to control surface runoff and keep soil losses to a minimum.

This map unit is in capability subclass VIe.

92—Portino-Thornock complex, 0 to 2 percent slopes. This map unit is on basalt flows. The vegetation is mainly shrubs and grasses. Elevation is about 4,500 to 4,600 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 120 days.

This unit is about 45 percent Portino silt loam and about 30 percent Thornock stony silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Lava flows and about 10 percent is Pocatello silt loam. The remaining 5 percent is small areas of Broxon silt loam and soils that have slopes of more than 2 percent.

The Portino soil is moderately deep and well drained. It formed in loess, in silty alluvium derived from loess, and in material weathered from basalt. Typically, the surface layer is grayish brown, calcareous silt loam 3 inches thick. The subsoil is pale brown, calcareous silt loam 6 inches thick. The substratum is very pale brown and pale brown, calcareous silt loam 20 inches thick over basalt. Depth to bedrock ranges from 20 to 40 inches.

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

The Thornock soil is shallow and well drained. It formed in loess, in silty alluvium derived from loess, and in material weathered from basalt. Typically, the upper 2 inches of the surface layer is grayish brown, calcareous stony silt loam, and the lower 5 inches is light brownish gray, calcareous silt loam. The underlying material to a depth of 14 inches is pale brown, calcareous silt loam. Basalt is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches.

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

Most areas of this unit are used as rangeland. A few areas are used for homesite and urban development.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly Wyoming big sagebrush, bluebunch wheatgrass, and Thurber needlegrass. Use of mechanical equipment such as rangeland plows and drills is not practical in most areas of this unit because of the areas of Rock outcrop and the stony surface of the Thornock soil.

This unit is poorly suited to homesite and urban development. The main limitations are the included areas of Lava flows and the depth to bedrock. The limited depth to bedrock interferes with excavation for installing utilities and does not provide adequate soil depth for septic tank absorption fields and basements.

This map unit is in capability subclass VIIs.

93—Rexburg silt loam, 1 to 4 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is grayish brown silt loam 10 inches thick. The subsoil is grayish brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is pale brown and light gray, calcareous silt loam.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Watercanyon silt loam on south- and west-facing side slopes. The remaining 5 percent is small areas of Hondoho gravelly silt loam on side slopes near drainageways and Rexburg soils that have slopes of more than 4 percent.

Permeability of this Rexburg soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. In both irrigated and nonirrigated areas, runoff is medium and the hazard of water erosion is moderate.

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

This unit is well suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by the hazard of water erosion. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope (fig. 9). Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to irrigated crops. It is used for the production of wheat, barley, alfalfa hay, and potatoes. The unit is limited mainly by the hazard of water erosion. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion.

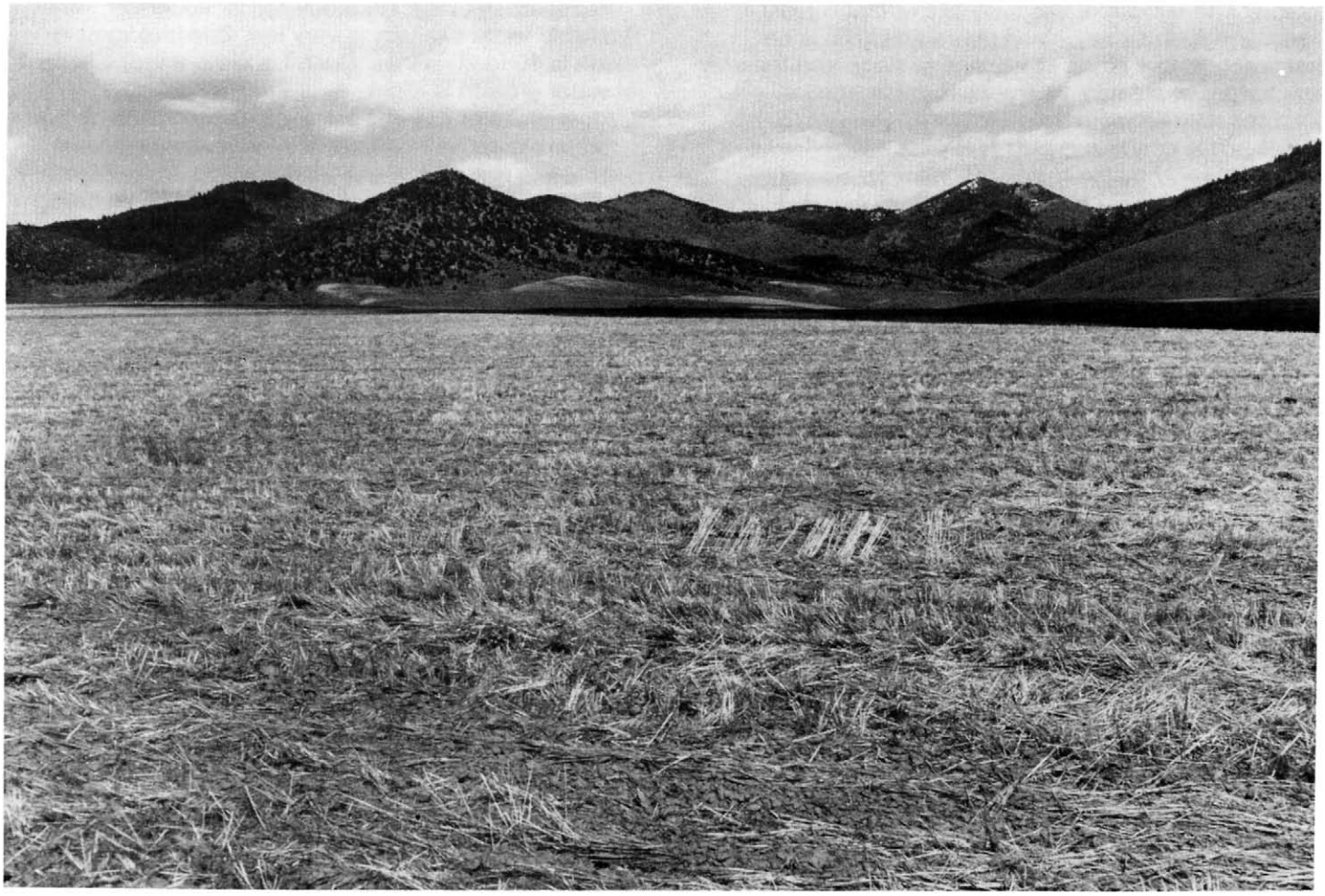


Figure 9.—Stubble mulch tillage on Rexburg silt loam, I to 4 percent slopes.

Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content. All tillage should be on the contour or across the slope.

The unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The unit is well suited to rangeland seeding.

This map unit is in capability subclasses IIIe, irrigated, and IIIc, nonirrigated.

94—Rexburg silt loam, 4 to 12 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is grayish brown silt loam 10 inches thick. The subsoil is grayish brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is pale brown and light gray, calcareous silt loam.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Watercanyon silt loam on south- and west-facing side slopes. The remaining 5 percent is small areas of Hondoho gravelly silt loam on side slopes near drainageways and Rexburg soils that have slopes of less than 4 percent or more than 12 percent.

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

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

This unit is well suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by the high hazard of water erosion. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is suited to irrigated crops. It is used for the production of wheat, barley, alfalfa hay, and potatoes. The unit is limited mainly by the very high hazard of water erosion. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Maintaining crop residue on or near the surface reduces runoff and helps to maintain soil tilth and organic matter content. All tillage should be on the contour or across the slope.

The soil in this unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The unit is suited to the use of mechanical equipment such as rangeland plows and drills.

This map unit is in capability subclasses IVe, irrigated, and IIIe, nonirrigated.

95—Rexburg silt loam, 12 to 20 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is grayish brown silt loam 10 inches thick. The subsoil is grayish brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is pale brown and light gray, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Watercanyon silt loam on south- and west-facing side slopes and about 5 percent is Hondoho gravelly silt loam on convex, north- and east-facing side slopes and along drainageways. The remaining 5 percent is small areas of Coalbank very fine sandy loam and soils that have slopes of less than 12 percent or more than 20 percent.

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

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

This unit is suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of

alfalfa hay. The unit is limited mainly by the high hazard of water erosion. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

The unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. This unit is suited to the use of mechanical equipment such as rangeland plows and drills. The main limitation is the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass IVe.

96—Rexburg silt loam, 20 to 40 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 5,000 to 6,000 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is grayish brown silt loam 10 inches thick. The subsoil is grayish brown silt loam 16 inches thick. The substratum to a depth of 60 inches or more is pale brown and light gray, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Hondoho cobbly silt loam on convex ridges and along drainageways and about 5 percent is Watercanyon silt loam on south-facing side slopes and ridgetops. The remaining 5 percent is small areas of Coalbank very fine sandy loam, Moonlight silt loam, Camelback gravelly silt loam, and soils that have slopes of less than 20 percent or more than 40 percent.

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

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

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. Use of mechanical equipment such as rangeland plows and drills is not practical because of the steepness of slope and the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This unit is poorly suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by the steepness of slope and the very high hazard of water erosion. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. Seeding to permanent cover may be needed to reduce erosion.

This unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This map unit is in capability subclass VIe.

97—Ririe silt loam, 1 to 4 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grass. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Watercanyon silt loam on south- and west-facing side slopes and about 5 percent is Hondoho gravelly silt loam on convex side slopes along drainageways. The remaining 5 percent is small areas of Joevar silt loam and Ririe soils that have slopes of less than 1 percent or more than 4 percent.

Permeability of this Ririe soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. In both irrigated and nonirrigated areas, runoff is medium and the hazard of water erosion is moderate.

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

This unit is well suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by low precipitation and the hazard of water erosion. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is well suited to irrigated crops. It is used for the production of wheat, barley, alfalfa hay, and potatoes. The unit is limited mainly by the hazard of water erosion. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Erosion is reduced and fertility maintained by using a suitable cropping system, crop residue management, minimum tillage, and proper fertilization.

This unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

The unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. The unit is well suited to the use of mechanical equipment such as rangeland plows and drills.

This map unit is in capability subclasses IIIe, irrigated, and IIIc, nonirrigated.

98—Ririe silt loam, 4 to 12 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Watercanyon silt loam on south- and west-facing side slopes and about 5 percent is Hondoho gravelly silt loam on convex side slopes along drainageways. The remaining 5 percent is small areas of Joevar silt loam and Ririe soils that have slopes of less than 4 percent or more than 12 percent.

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

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

This unit is well suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by low precipitation and the high hazard of water erosion. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Terraces reduce runoff and the risk of erosion and help to conserve moisture. Special designs for terraces and diversions are needed because of the shallow depth to moderately alkaline and strongly alkaline soil material. Bringing this material to the surface reduces the production of crops. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is suited to irrigated crops. It is used for the production of wheat, barley, and small amounts of alfalfa hay and potatoes. The unit is limited mainly by the very high hazard of erosion. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Erosion is reduced and fertility maintained by using a suitable cropping system, crop residue management, minimum tillage, and proper fertilization. All tillage should be on the contour or across the slope.

This unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. It has few limitations. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch

wheatgrass. The unit is suited to the use of mechanical equipment such as rangeland plows and drills.

This map unit is in capability subclasses IVe, irrigated, and IIIe, nonirrigated.

99—Ririe silt loam, 12 to 20 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in silty alluvium derived from loess. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Watercanyon silt loam on south- and west-facing side slopes and about 5 percent is Hondoho gravelly silt loam on convex side slopes along drainageways. The remaining 5 percent is small areas of Joevar silt loam and Ririe soils that have slopes of less than 12 percent or more than 20 percent.

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

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

This unit is suited to nonirrigated crops. It is used for the production of wheat, barley, and a small amount of alfalfa hay. The unit is limited mainly by low precipitation and the very high hazard of water erosion. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush and bluebunch wheatgrass. This unit is suited to the use of mechanical equipment such as rangeland plows and drills. The main limitation is the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass IVe.

100—Ririe-Watercanyon complex, 4 to 12 percent slopes. This map unit is on foothills and fan terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

This unit is about 60 percent Ririe silt loam and about 30 percent Watercanyon silt loam. The Ririe soil is on slightly concave or plane, north- and east-facing side slopes, and the Watercanyon soil is on ridgetops and slightly convex, south- and west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Hondoho cobbly silt loam on convex side slopes along drainageways. The remaining 5 percent is small areas of Joevar silt loam, Inkom silt loam, and soils that have slopes of less than 4 percent or more than 12 percent.

The Ririe soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

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

The Watercanyon soil is very deep and well drained. It formed in loess and in alluvium derived from loess. Typically, the surface layer is pale brown calcareous silt loam 7 inches thick. The subsoil is pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, light gray, and very pale brown, calcareous silt loam.

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

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

This unit is well suited to nonirrigated crops. It is used for the production of wheat and barley (fig. 10). The unit is limited mainly by low precipitation and the high hazard of water erosion. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Terraces reduce runoff and the risk of erosion and help to conserve

moisture. Special designs for terraces and diversions are needed because of the shallow depth to moderately alkaline and strongly alkaline soil material. Bringing this material to the surface also reduces the production of crops. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

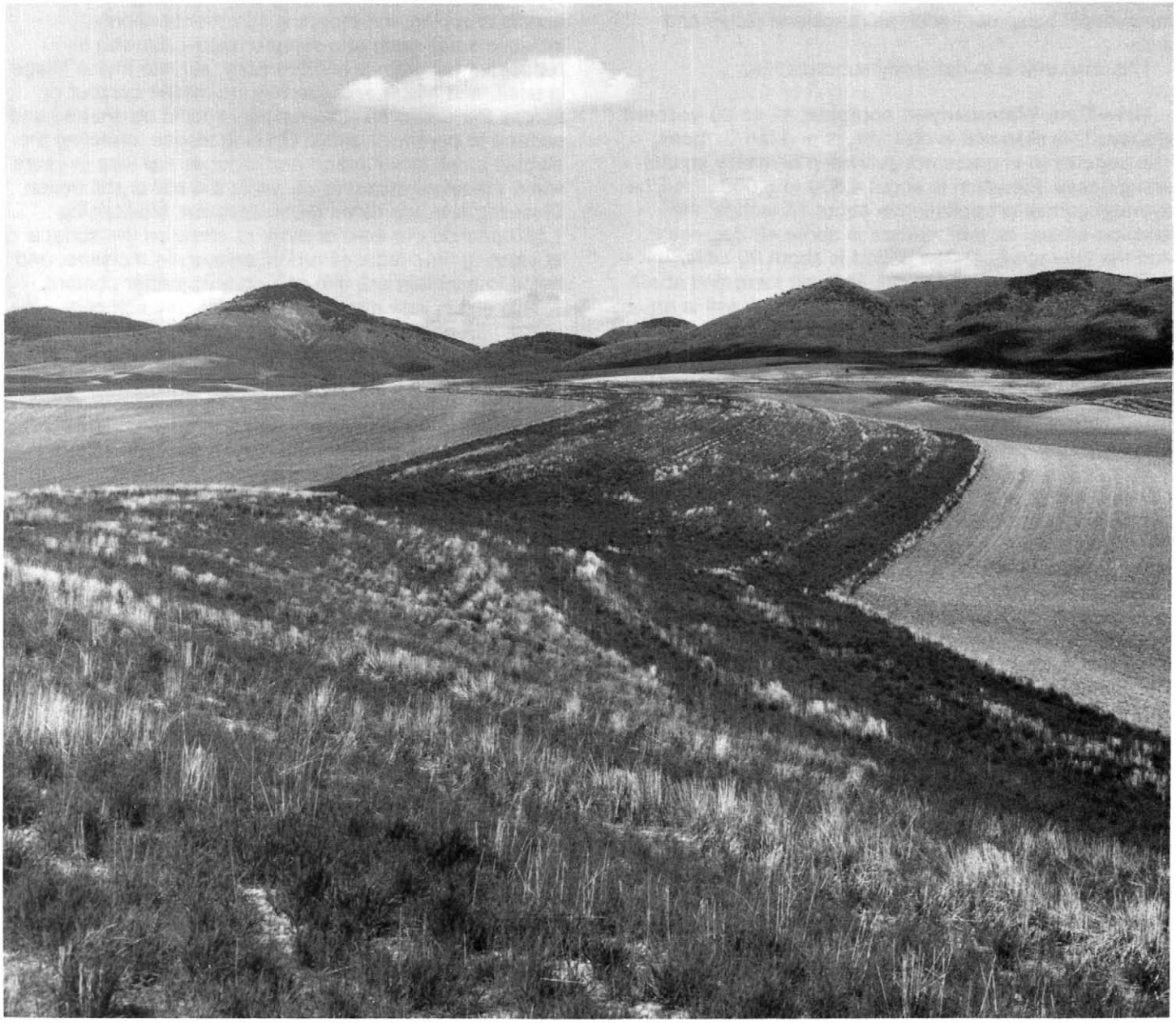


Figure 10.—Typical area of Ririe-Watercanyon complex, 4 to 12 percent slopes. Watercanyon soil has been seeded to pubescent wheatgrass as a soil conservation measure.

This unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. The potential natural plant community on the Ririe soil is mainly mountain big sagebrush and bluebunch wheatgrass. The potential natural plant community on the Watercanyon soil is mainly mountain big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. This unit is suited to the use of mechanical equipment such as rangeland plows and drills.

This map unit is in capability subclass IIIe.

101—Ririe-Watercanyon complex, 12 to 20 percent slopes. This map unit is on foothills and fan terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

This unit is about 50 percent Ririe silt loam and about 30 percent Watercanyon silt loam. The Ririe soil is on plane to slightly concave, north- and east-facing side slopes, and the Watercanyon soil is on ridgetops and slightly convex, south- and west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Hondoho cobbly silt loam on convex side slopes along drainageways and on some north-facing side slopes, about 5 percent is Cedarhill very cobbly silt loam on south- and west-facing side slopes, and about 5 percent is Ricrest gravelly silt loam on slightly convex, south- and west-facing side slopes. The remaining 5 percent is small areas of Joevar silt loam, Inkom silt loam, and soils that have slopes of less than 12 percent or more than 20 percent.

The Ririe soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

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

The Watercanyon soil is very deep and well drained. It formed in loess and in alluvium derived from loess. Typically, the surface layer is pale brown, calcareous silt loam 7 inches thick. The subsoil is pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, light gray, and very pale brown, calcareous silt loam.

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

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

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by low precipitation and the very high hazard of water erosion. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content.

This unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. The potential natural plant community on the Ririe soil is mainly mountain big sagebrush and bluebunch wheatgrass. The potential natural plant community on the Watercanyon soil is mainly mountain big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. This unit is suited to the use of mechanical equipment such as rangeland plows and drills. The main limitation is the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass IVe.

102—Ririe-Watercanyon complex, 20 to 30 percent slopes. This map unit is on foothills and fan terraces. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,800 to 6,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

This unit is about 50 percent Ririe silt loam and about 30 percent Watercanyon silt loam. The Ririe soil is on plane to slightly concave, north- and east-facing side slopes, and the Watercanyon soil is on ridgetops and slightly convex, south- and west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Hondoho cobbly silt loam on convex side slopes along drainageways and on some north-facing side slopes, about 5 percent is Cedarhill very cobbly silt loam on south- and west-facing side slopes, and about 5 percent is Ricrest gravelly silt loam on slightly convex, south- and west-facing side slopes. The remaining 5 percent is small areas of Joevar silt loam, Inkom silt loam, and soils that have slopes of less than 20 percent or more than 30 percent.

The Ririe soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

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

The Watercanyon soil is very deep and well drained. It formed in loess and in alluvium derived from loess. Typically, the surface layer is pale brown, calcareous silt loam 7 inches thick. The subsoil is pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, light gray, and very pale brown, calcareous silt loam.

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

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

This unit is well suited to use as rangeland. The potential natural plant community on the Ririe soil is mainly mountain big sagebrush and bluebunch wheatgrass. The potential natural plant community on the Watercanyon soil is mainly mountain big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope and the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

This unit is poorly suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by the steepness of slope, the very high hazard of water erosion, and low precipitation. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. This unit may need to be seeded to permanent cover to reduce erosion.

This unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This map unit is in capability subclass VIe.

103—Ririe-Watercanyon-Cedarhill complex, 12 to 30 percent slopes. This map unit is on foothills and mountainsides. The native vegetation is mainly small trees, shrubs, and grasses. Elevation is about 4,900 to 6,200 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

This unit is about 30 percent Ririe silt loam, about 25 percent Watercanyon silt loam, and about 20 percent Cedarhill very cobbly silt loam. The Ririe soil is generally on plane or slightly concave, north- and east-facing side slopes, the Watercanyon soil is generally on plane to slightly convex, south- and west-facing side slopes, and the Cedarhill soil is generally on convex, south- and west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Ricrest gravelly silt loam on concave, north- and east-facing side slopes, about 5 percent is Trailcreek very fine sandy loam near volcanic ash outcrops, generally on south- and west-facing side slopes, and about 5 percent is Lonigan cobbly silt loam near volcanic breccia and tuff outcrops, generally on south- and west-facing side slopes. The remaining 5 percent is small areas of Hondoho cobbly silt loam, Lanoak silt loam, Rock outcrop, volcanic ash, tuff, volcanic breccia, and soils that have slopes of less than 12 percent or more than 30 percent.

The Ririe soil is very deep and well drained. It formed in loess and in silty alluvium derived from loess. Typically, the surface layer is brown silt loam 12 inches thick. The underlying material to a depth of 60 inches or more is pale brown and very pale brown, calcareous silt loam.

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

The Watercanyon soil is very deep and well drained. It formed in loess and in alluvium derived from loess.

Typically, the surface layer is pale brown calcareous silt loam 7 inches thick. The subsoil is pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, light gray, and very pale brown, calcareous silt loam.

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

The Cedarhill soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from limestone and related sedimentary and metasedimentary rock. Typically, the surface layer is brown, calcareous very cobbly silt loam 9 inches thick. The upper 19 inches of the underlying material is very pale brown and light yellowish brown, calcareous very cobbly silt loam, and the lower part to a depth of 60 inches or more is light yellowish brown, calcareous very cobbly loam.

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

Most areas of the Ririe and Watercanyon soils are used as rangeland. Most areas of the Cedarhill soil are used as grazeable woodland and woodland. A few areas of this unit are used as nonirrigated cropland.

This unit is well suited to use as rangeland and grazeable woodland. The potential natural plant community on the Ririe soil is mainly mountain big sagebrush and bluebunch wheatgrass. The potential natural plant community on the Watercanyon soil is mainly mountain big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. The potential natural plant community on the Cedarhill soil is mainly Utah juniper, bluebunch wheatgrass, and Indian ricegrass. Mechanical equipment such as rangeland plows and drills is suited to use in areas of the Ririe and Watercanyon soils that have slopes of 20 percent or less, but their use is limited on the Cedarhill soil because of the very cobbly surface. Use of mechanical equipment is not practical in areas where slopes are more than 20 percent because of the very high hazard of erosion and the very cobbly surface of the Cedarhill soil.

This unit is poorly suited to nonirrigated crops. It is used for the production of wheat and barley. The unit is limited mainly by low precipitation, by the very high hazard of erosion, and by the very cobbly surface of the Cedarhill soil. Because precipitation is marginal for annual cropping, the cropping system commonly includes small grain and summer fallow. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds per acre or more of straw on the surface at planting time reduces runoff, conserves moisture, and helps to maintain soil tilth and organic matter content. The areas of soils that have slopes of more than 20 percent and the very cobbly surface of the Cedarhill soil may hinder the use of machinery. The areas of soils that have slopes of more than 20 percent may need to be seeded to permanent cover to reduce erosion.

In a few areas of the Cedarhill soil, some Utah juniper is cut for fenceposts and firewood. On the basis of a basal area attained when the diameter of trees at a height of 1 foot averages 5 inches, the average site index for Utah juniper is 105. Yield tables indicate that the maximum average annual growth is 31 cubic feet per acre of Utah juniper at 100 years of age.

This map unit is in capability subclass VIe.

104—Rock outcrop. This map unit is on steep and very steep sides of mountains and canyons. It is about 95 percent outcrops of various kinds of rock, mainly quartzite, limestone, and dolomite. The rock is fractured in places, and some soil material is in the crevices. The remaining 5 percent is small areas of Valmar soils in areas of quartzite outcroppings and of Ireland and Ridgecrest soils in areas of limestone and dolomite outcroppings.

This map unit is not suited to most land uses.

This map unit is in capability subclass VIIIs.

105—Rubble land-Haploxerolls complex, steep. This map unit is on the edges of the Portneuf Basalt. Slopes are dominantly 30 to 60 percent, but they range from about 20 percent to vertical cliffs. The native vegetation is mainly shrubs and grasses, which are on the Haploxerolls part of the unit. Elevation is about 4,500 to 4,700 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

This unit is about 50 percent Rubble land and about 40 percent Haploxerolls. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is gravel deposited by the Bonneville Flood. The remaining 5 percent is small areas of Lava flows and soils that have slopes of less than 20 percent.

Rubble land consists mainly of areas of stones and boulders that support little vegetation except for mosses and lichens and a few stunted shrubs or trees growing between the rock fragments. It was deposited primarily by the spalling of the edges and cliffs of the Portneuf basalt. The stones and boulders are angular to subangular and are 1 foot to 10 feet in diameter. Areas of Rubble land are not suited to most land uses.

Haploxerolls consist of deep and very deep, well drained soils that are too variable in texture to map as individual units. They formed in alluvium and colluvium derived from mixed sources. Typically, the surface layer is grayish brown gravelly silt loam, cobbly sandy loam, or extremely bouldery loam about 8 inches thick. The subsoil is brown gravelly silt loam, very gravelly silt loam, very cobbly sandy loam, or extremely bouldery loam about 7 inches thick. The substratum to a depth of 40 to 60 inches is pale brown very gravelly silt loam, very cobbly sand, or extremely bouldery sandy loam.

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

This unit is used as rangeland in areas that are accessible and where slopes are not excessive.

This unit is very poorly suited to use as rangeland. The potential natural plant community on the Haploxerolls is mainly mountain big sagebrush and bluebunch wheatgrass. The main limitations are steepness of slope, areas devoid of vegetation, and accessibility.

This map unit is in capability subclass VIIs.

106—Scout Variant-Camelback Variant association, 30 to 60 percent slopes. This map unit is on mountainsides. Elevation is about 7,000 to 9,200 feet.

This unit is about 40 percent Scout Variant gravelly silt loam and about 35 percent Camelback Variant gravelly silt loam. The Scout Variant soil is on concave side slopes, and the Camelback Variant soil is on convex side slopes.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is Sedgway gravelly silt loam on concave, south- and west-facing side slopes, about 5 percent is Beaverdam silt loam on concave, north- and east-facing side slopes, about 5 percent is Mikesell silt loam in concave areas on the lower part of side slopes, and about 5 percent is soils that have slopes of less than 30 percent or more than 60 percent. The remaining 5 percent is small areas of Rock outcrop, talus, a soil that is similar to the Scout Variant soil but has an extremely stony surface layer, and Valmar Variant very stony silt loam.

The Scout Variant soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from quartzite. The native vegetation is mainly trees and grasses. The average annual precipitation is about 30 inches, the average annual air temperature is about 37 degrees F, and the average frost-free period is less than 50 days. Typically, an intermittent duff layer about 2 inches thick is on the surface. The surface layer is brown gravelly silt loam 3 inches thick. The subsurface layer is pale brown very cobbly silt loam 13 inches thick. The subsoil to a depth of 60 inches or more is light yellowish brown extremely stony silt loam and extremely cobbly loam.

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

The Camelback Variant soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from quartzite. The native vegetation is mainly shrubs and grasses. The average annual precipitation is about 22 inches, the average annual air temperature is about 39 degrees F, and the average frost-free period is about 60 days. Typically, the surface layer is very dark grayish brown and dark brown gravelly silt loam 10 inches thick. The upper 21 inches of the subsoil is yellowish brown very cobbly loam, and the lower part to a depth of 60 inches or more is yellowish brown extremely cobbly loam.

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

This unit is used as woodland, grazeable woodland, and rangeland.

The potential natural plant community on the Scout Variant soil is mainly an overstory of subalpine fir and an understory dominated by pine reedgrass. The potential natural plant community on the Camelback Variant soil is mainly subalpine big sagebrush, mountain snowberry, and slender wheatgrass.

The Scout Variant soil is suited to the production of subalpine fir. On the basis of a 100-year site curve, the average site index for subalpine fir is 70. Yield tables indicate that the maximum average annual growth is 63 cubic feet per acre of subalpine fir at 110 years of age. The main concerns in producing and harvesting timber are the hazard of water erosion, the steepness of slope, and the hazard of plant competition. Minimizing the risk of erosion is essential in harvesting timber. Erosion can be reduced by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Cuts and fills should be seeded, and water bars and culverts should be installed. The steepness of slope limits the kinds of equipment that can be used for harvesting timber. If the site is not adequately prepared, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees.

The Scout Variant soil is suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 15 to 30 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. Use of forage by livestock in some areas of this soil is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. In spring, cold soil

temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

The Camelback Variant soil is suited to use as rangeland. It is limited mainly by steepness of slope and cool soil temperatures. Use of mechanical equipment such as rangeland plows and drills is not practical on this soil because of the steepness of slope. Use of forage by livestock in some areas of this soil is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

This map unit is in capability subclass VIIe.

107—Sedgway-Beaverdam complex, 30 to 60 percent slopes. This map unit is on mountainsides. The native vegetation is mainly trees with an understory dominated by grasses. Elevation is about 6,000 to 7,500 feet. The average annual precipitation is about 26 inches, the average annual air temperature is about 39 degrees F, and the average frost-free period is less than 50 days.

This unit is about 40 percent Sedgway gravelly silt loam and about 35 percent Beaverdam silt loam. The Sedgway soil is typically on the shoulder slopes and midslopes, and the Beaverdam soil is typically on the foot slopes. This unit is mostly on north- and east-facing side slopes.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Yago extremely stony silty clay loam on shoulder slopes, about 5 percent is Toponce silt loam on concave, south- or west-facing foot slopes, and about 5 percent is Dateman cobbly silt loam on shoulder slopes and ridgetops. The remaining 5 percent is small areas of Pavohroo silt loam, a soil that is similar to the Beaverdam soil but has an extremely bouldery surface layer, Camelback very gravelly silt loam, Valmar very cobbly silt loam, Ireland extremely stony silt loam, Rock outcrop, and very deep, poorly drained and somewhat poorly drained soils.

The Sedgway soil is very deep and well drained. It formed in alluvium and colluvium derived dominantly from sedimentary and metasedimentary rock. Typically, an intermittent duff layer of needles, leaves, twigs, and grass about 2 inches thick is on the surface. The upper 5 inches of the surface layer is very dark grayish brown gravelly silt loam, and the lower 7 inches is dark grayish brown very cobbly silt loam. The subsurface layer is pale brown very cobbly loam 9 inches thick. The upper 6 inches of the subsoil is 80 percent yellowish brown very cobbly clay loam and 20 percent pale brown very cobbly loam, and the lower part to a depth of 60 inches or more is yellowish brown very cobbly clay loam.

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

The Beaverdam soil is very deep and well drained. It formed in mixed alluvium derived dominantly from quartzite and sandstone. Typically, an intermittent duff layer of needles, leaves, twigs, and grass 1.5 inches thick is on the surface. The surface layer is dark grayish brown and brown silt loam 12 inches thick. The subsoil to a depth of 60 inches or more is light yellowish brown silty clay loam and silty clay.

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

This unit is used mainly for timber production. It is also used for grazing.

The potential natural plant community on the unit is mainly an overstory of Douglas-fir and an understory dominated by pine reedgrass.

The Sedgway and Beaverdam soils are well suited to the production of Douglas-fir. On the basis of a 50-year site curve, the average site index for Douglas-fir on the Sedgway soil is 65. Yield tables indicate that the maximum average annual growth is 85 cubic feet per acre of Douglas-fir at 40 years of age. On the basis of a 50-year site curve, the average site index for Douglas-fir on the Beaverdam soil is 70. Yield tables indicate that the maximum average annual growth is 96 cubic feet per acre of Douglas-fir at 40 years of age.

The main concerns in producing and harvesting timber are the hazard of water erosion, slope, and the hazard of plant competition. Minimizing the risk of erosion is essential in harvesting timber. Excessive erosion is avoided by carefully planning the construction and maintenance of logging roads, skid trails, and landings. Cuts and fills should be seeded, and water bars and culverts should be installed. The steepness of slope limits the kinds of equipment that can be used for harvesting timber. If the overstory canopy is removed, the soil temperature increases. This may hinder the regeneration of timber. Competition from quaking aspen, shrubs, and grasses may also hinder regeneration. If the site is not adequately prepared, competition from undesirable plants can prevent or prolong natural or artificial reestablishment of trees.

This unit is suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 30 to 60 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth. Use of forage by livestock in some areas of this unit is limited because of

the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas.

Livestock and wildlife concentrate in the included areas of poorly drained and somewhat poorly drained soils within this unit. These areas provide access to water, and they produce the more palatable vegetation when not overused. If economically feasible, these areas should be managed using a deferred grazing system. It is likely that many of these areas will be considered sacrifice areas when developing an overall grazing plan.

This map unit is in capability subclass VIIe.

108—Slickens. Slickens is made up largely of chemically treated freshly, ground rock that is a waste product of phosphate ore mills. The material is detrimental to plant growth.

This unit is not suited to most land uses.

This map unit is in capability subclass VIIIs.

109—Swanner-Hondoho complex, 12 to 20 percent slopes. This map unit is on mountainsides. The native vegetation is mainly shrubs and grasses. Elevation is about 5,000 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 95 days.

This unit is about 50 percent Swanner extremely stony loam and about 30 percent Hondoho cobbly silt loam. The Swanner soil is on west-facing side slopes above vertical cliffs and on ridgetops, and the Hondoho soil is on east-facing, concave side slopes and on west-facing foot slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Rock outcrop intermingled with areas of the Swanner soil, about 5 percent is Ririe silt loam on concave, north- and east-facing side slopes, and about 5 percent is soils that are similar to the Swanner soil but have slopes of less than 12 percent. The remaining 5 percent is small areas of soils that are similar to the Swanner soil but have a gravelly surface and soils that have slopes of more than 20 percent.

The Swanner soil is shallow and well drained. It formed in loess, silty alluvium, and material weathered from andesite. Typically, the surface layer is dark brown extremely stony loam 9 inches thick. The subsoil is yellowish brown extremely stony loam 8 inches thick. Andesite is at a depth of 17 inches. Depth to bedrock ranges from 10 to 20 inches.

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

The Hondoho soil is very deep and well drained. It formed in mixed alluvium. Typically, the surface layer is grayish brown cobbly silt loam 8 inches thick. The subsoil is brown, calcareous cobbly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very cobbly loam.

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

This unit is used as rangeland.

This unit is poorly suited to use as rangeland. The main limitations are the limited amount of forage produced by the Swanner soil and the shortage of water for livestock. The potential natural plant community on the Swanner soil is mainly bluebunch wheatgrass and low sagebrush. The potential natural plant community on the Hondoho soil is mainly bluebunch wheatgrass and mountain big sagebrush. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the extremely stony surface of the Swanner soil, the cobbly surface of the Hondoho soil, and the areas of Rock outcrop.

This map unit is in capability subclass VIIs.

110—Swanner-Rock outcrop complex, 50 to 80 percent slopes. This map unit is on mountainsides. The native vegetation is mainly shrubs and grasses. Elevation is about 4,700 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is abut 90 days.

This unit is about 45 percent Swanner extremely stony loam and about 30 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is talus in areas below Rock outcrop and about 5 percent is vertical rock cliffs. The remaining 10 percent is small areas of Ririe silt loam, soils that have slopes of less than 50 percent, and Cedarhill very cobbly silt loam.

The Swanner soil is shallow and well drained. It formed in loess, silty alluvium, and material weathered from andesite. Typically, the surface layer is dark brown extremely stony loam 9 inches thick. The subsoil is yellowish brown extremely stony loam 8 inches thick. Andesite is at a depth of 17 inches. Depth to bedrock ranges from 10 to 20 inches.

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

Rock outcrop consists of areas of exposed andesite. It is weathered and fractured and can occur anywhere in this unit.

Areas of this unit suitable for grazing are used as rangeland.

This unit is poorly suited to use as rangeland. The main limitations are low production, steepness of slope, and the areas of Rock outcrop. The potential natural plant community on the Swanner soil is mainly low sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Livestock watering facilities need to be developed or improved for summer and fall use of the unit. Use of mechanical equipment such as rangeland plows and drills is not practical because of the steepness of slope, the areas of Rock outcrop, and the extremely stony surface of the Swanner soil.

This map unit is in capability subclass VIIs.

111—Tendoy muck, drained, 0 to 1 percent slopes. This very deep, very poorly drained soil is on flood plains. It formed in organic material derived from herbaceous plants. The drainage of this unit has been altered by dredging and straightening of stream channels. The native vegetation is mainly grasses, sedges, and rushes. Elevation is about 4,550 to 4,750 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is very dark grayish brown, calcareous silt loam 2 inches thick. The upper 5 inches of the next layer is black, calcareous sapric material, and the lower 3 inches is black sapric material. The next layer to a depth of 60 inches or more is black sapric material.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 10 percent is soils that are similar to the Tendoy soil but are less than 60 inches deep over mineral soil material. These soils are near the edges of the bog and on isolated islands in the unit. The remaining 5 percent is small areas of Bear Lake silt loam, Downata silt loam, and soils that have as much as 20 inches of mineral soil material over organic layers; small ponds; and small areas of soils that are more than 35 percent rock fragments.

Permeability of this Tendoy soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more for water-tolerant plants. This soil has a seasonal high water table that extends from 6 inches above the surface to 6 inches below the surface from February through June. Runoff is very slow, and the hazard of water erosion is none. This soil is subject to frequent, brief periods of flooding from January through June. It is subject to subsidence and accelerated decomposition of the organic matter if it is allowed to dry. The water table should be maintained as near the surface as feasible. Also, this soil will burn when dry. It is very difficult to extinguish a fire in this soil; flooding of the area may be needed to put the fire out.

This unit is used for the production of meadow hay and pasture.

This unit is suited to hay and pasture. The potential natural plant community on the unit is mainly Nebraska sedge, other sedges, and tufted hairgrass. The main limitation is wetness. Wetness limits the choice of plants and the period of harvesting or grazing and increases the risk of winterkill. Plants that tolerate wetness should be seeded. Grazing and harvesting of hay should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock and support the weight of harvesting equipment. This unit is capable of producing about 2 tons of grass hay per acre if not irrigated and about 2.5 tons if irrigated.

This map unit is in capability subclass Vw, irrigated and nonirrigated.

112—Toponce-Broadhead association, 6 to 30 percent slopes. This map unit is on foothills and fan terraces. Elevation is about 6,200 to 6,900 feet.

This unit is about 50 percent Toponce silt loam and about 30 percent Broadhead silt loam. The Toponce soil is in concave areas, and the Broadhead soil is in convex areas.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 10 percent is Yago extremely stony silty clay loam and about 5 percent is soils that are similar to the Broadhead soil but have a high shrink-swell potential in the surface layer; these soils are on landscape positions similar to those of the Broadhead soil. The remaining 5 percent is small areas of Sedgway gravelly silt loam, Hades gravelly silt loam, and Beaverdam silt loam.

The Toponce soil is very deep and well drained. It formed in alluvium derived dominantly from quartzite and sandstone. The native vegetation is mainly trees and grasses. The average annual precipitation is about 22 inches, the average annual air temperature is about 39 degrees F, and the average frost-free period is about 55 days. Typically, the upper 3 inches of the surface layer is dark grayish brown silt loam and the lower 11 inches is dark grayish brown silty clay loam. The subsoil to a depth of 60 inches or more is dark brown silty clay loam and brown silty clay and clay.

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

The Broadhead soil is very deep and well drained. It formed in mixed alluvium derived dominantly from quartzite and sandstone. The native vegetation is mainly shrubs and grasses. The average annual precipitation is

about 20 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 70 days. Typically, the upper 2 inches of the surface layer is very dark grayish brown silt loam and the lower 7 inches is very dark grayish brown silty clay loam. The subsoil to a depth of 60 inches or more is dark grayish brown and brown silty clay loam.

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

This unit is used as woodland, grazeable woodland, and rangeland.

The potential natural plant community on the Toponce soil is mainly an overstory of quaking aspen and an understory dominated by pine reedgrass. The potential natural plant community on the Broadhead soil is mainly mountain big sagebrush and bluebunch wheatgrass.

The Toponce soil is suited to the production of quaking aspen. On the basis of an 80-year site curve, the average site index for quaking aspen is 65. Yield tables indicate that the maximum average annual growth is 36 cubic feet per acre of quaking aspen at 80 years of age. Most of the aspen harvested is used as firewood.

This Toponce soil is also well suited to the production of understory plants suitable for grazing. It can produce additional forage for livestock and wildlife for 10 to 20 years after the canopy is opened by logging, fire, or other disturbance. During this period annual production of understory ranges from 3,000 pounds of air-dry vegetation per acre to less than 300 pounds per acre as the canopy closes. In spring, cold soil temperatures limit early plant growth. Grazing should be delayed until the plants have achieved sufficient growth.

The Broadhead soil is well suited to use as rangeland. Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff. The suitability of this soil for rangeland seeding is good. Seedbed preparation should be on the contour or across the slope where practical.

This map unit is in capability subclass IVe.

113—Urban land-Bahem-Broxon complex, 0 to 3 percent slopes. This map unit is on terraces. Elevation is about 4,400 to 4,500 feet. The average annual precipitation is about 10 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Urban land, about 20 percent Bahem silt loam, and about 20 percent Broxon silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Broncho cobbly loam on terrace breaks. The remaining 5 percent is small areas of McDole silt loam and soils that have slopes of more than 3 percent.

Urban land consists of streets, parking lots, buildings, and other structures within the cities of Pocatello and Chubbuck.

The Bahem soil is very deep and well drained. It formed in silty alluvium overlying flood-deposited sand, gravel, cobbles, and stones of mixed mineralogy. Typically, the surface layer is pale brown, calcareous silt loam 11 inches thick. The upper 38 inches of the underlying material is pale brown, white, and light gray, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored extremely cobbly sand. Depth to extremely cobbly sand ranges from 40 to 60 inches.

Permeability of the Bahem soil is moderate to a depth of 49 inches and very rapid below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

The Broxon soil is very deep and well drained. It formed in silty alluvium overlying flood-deposited sand, gravel, cobbles, and stones of mixed mineralogy. Typically, the surface layer is pale brown, calcareous silt loam 8 inches thick. The upper 17 inches of the underlying material is white and pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored extremely stony sand. Depth to extremely stony sand ranges from 20 to 40 inches.

Permeability of the Broxon soil is moderate to a depth of 25 inches and very rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight.

Most areas of this unit are used for homesite and urban development. A few areas are used for recreation.

If this unit is used for homesite and urban development, the main limitations are the moderate permeability of the Bahem soil, seepage in the Broxon soil, and the hazard of frost action in the silty overlying material and the hazard of cutbanks caving in because of the underlying material of both soils. Community sewage systems are needed on this unit. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. Cutbanks are not stable and are subject to slumping.

This unit is well suited to recreational development. It is limited mainly by dustiness. Areas used for recreation can be protected from dustiness by maintaining plant cover.

This unit is not assigned to a capability subclass.

114—Urban land-Bahem-Broxon complex, 3 to 6 percent slopes. This map unit is on terraces. Elevation is about 4,400 to 4,500 feet. The average annual precipitation is about 10 inches, the average annual air

temperature is about 47 degrees F, and the average frost-free period is about 120 days.

This unit is about 50 percent Urban land, about 20 percent Bahem silt loam, and about 20 percent Broxon silt loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 10 percent of the total acreage of this unit. Of this, about 5 percent is Broncho cobbly loam on terrace breaks. The remaining 5 percent is small areas of Broncho Variant very gravelly loam, Pocatello silt loam, and soils that have slopes of more than 6 percent.

Urban land consists of streets, parking lots, buildings, and other structures within the cities of Pocatello and Chubbuck.

The Bahem soil is very deep and well drained. It formed in silty alluvium overlying flood-deposited sand, gravel, cobbles, and stones of mixed mineralogy. Typically, the surface layer is pale brown, calcareous silt loam 11 inches thick. The upper 38 inches of the underlying material is pale brown, white, and light gray, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored extremely cobbly sand. Depth to extremely cobbly sand ranges from 40 to 60 inches.

Permeability of the Bahem soil is moderate to a depth of 49 inches and very rapid below this depth. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

The Broxon soil is very deep and well drained. It formed in silty alluvium overlying flood-deposited sand, gravel, cobbles and stones of mixed mineralogy. Typically, the surface layer is pale brown, calcareous silt loam 8 inches thick. The upper 17 inches of the underlying material is white and pale brown, calcareous silt loam, and the lower part to a depth of 60 inches or more is multicolored extremely stony sand. Depth to extremely stony sand ranges from 20 to 40 inches.

Permeability of the Broxon soil is moderate to a depth of 25 inches and very rapid below this depth. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate.

Most areas of this unit are used for homesite and urban development. A few areas are used for recreation.

If this unit is used for homesite and urban development, the main limitations are the hazard of water erosion, the moderate permeability of the Bahem soil, seepage in the Broxon soil, and the hazard of frost action in the silty overlying material and the hazard of cutbanks caving in because of the underlying material of both soils. The risk of erosion is increased if the soils are left exposed during site development. Erosion can be controlled and maintenance costs reduced by stabilizing areas that have been disturbed. Community sewage systems are needed on this unit. Frost action potential is a limitation in maintaining roads, streets, driveways, and sidewalks. Cutbanks are not stable and are subject to slumping.

This unit is well suited to recreational development. It is limited mainly by dustiness. Areas used for recreation can be protected from dustiness by maintaining plant cover.

This unit is not assigned to a capability subclass.

115—Valmar very cobbly silt loam, low precipitation, 40 to 80 percent slopes. This moderately deep, well drained soil is on convex mountainsides. It formed in alluvium, colluvium, and residuum derived dominantly from quartzite and other related metasedimentary rock. The native vegetation is mainly shrubs and grasses. Elevation is about 5,000 to 6,800 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is dark brown and brown very cobbly silt loam 9 inches thick. The upper 5 inches of the subsoil is yellowish brown very cobbly silt loam, and the lower 10 inches is yellowish brown extremely stony silt loam. Quartzite is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 5 percent is a soil that is similar to the Valmar soil but is less than 20 inches deep to bedrock and is on windswept ridges, about 5 percent is Rock outcrop on convex ridges and very steep slopes, about 5 percent is talus below areas of Rock outcrop, and about 5 percent is Camelback very cobbly silt loam in slightly concave areas. The remaining 5 percent is small areas of soils that have slopes of less than 40 percent, volcanic ash outcrops, and Trailcreek very fine sandy loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. It is limited mainly by steepness of slope. The potential natural plant community on the unit is mainly mountain big sagebrush, bluebunch wheatgrass, and Nevada bluegrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. Use of mechanical equipment such as rangeland plows and drills is not practical because of the steepness of slope and the very cobbly surface of the soil. Nonmechanical treatment practices may be more suitable.

This map unit is in capability subclass VIIe.

116—Valmar-Camelback-Hades complex, 30 to 60 percent slopes. This map unit is on mountainsides. The native vegetation is mainly shrubs and grasses. Elevation is about 5,000 to 6,500 feet. The average annual precipitation is about 19 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days.

This unit is about 40 percent Valmar very cobbly silt loam, about 25 percent Camelback gravelly silt loam, and about 20 percent Hades gravelly silt loam. The Valmar soil is on convex side slopes and on ridges, the Camelback soil is on slightly convex side slopes, and the Hades soil is in concave areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Moonlight silt loam on concave, north- and east-facing side slopes and about 5 percent is soils that are similar to the Valmar soil but are less than 20 inches deep to bedrock and are on ridgetops. The remaining 5 percent is small areas of Rock outcrop, Cedarhill very cobbly silt loam, Ireland extremely stony silt loam, Pavohroo silt loam, Rexburg silt loam, Broadhead silt loam, Trailcreek very fine sandy loam, Coalbank very fine sandy loam, a very deep soil that is similar to the Hades soil and is along drainageways, and soils that have slopes of less than 30 percent or more than 60 percent.

The Valmar soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived from quartzite. Typically, the surface layer is dark brown and brown very cobbly silt loam 9 inches thick. The upper 5 inches of the subsoil is yellowish brown very cobbly silt loam, and the lower 10 inches is yellowish brown extremely stony silt loam. Quartzite is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

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

The Camelback soil is deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from quartzite. Typically, the surface layer is dark brown gravelly silt loam 21 inches thick. The subsoil is dark brown and yellowish brown extremely cobbly silt loam 21 inches thick. Quartzite is at a depth of 42 inches. Depth to bedrock ranges from 40 to 60 inches.

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

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass, mountain big sagebrush, and Nevada bluegrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical because of the steepness of slope and the very cobbly surface of the Valmar soil.

This map unit is in capability subclass VIIe.

117—Valmar-Hades complex, 20 to 50 percent slopes. This map unit is on mountainsides and ridges. The native vegetation is mainly shrubs and grasses. Elevation is about 5,200 to 6,500 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 42 degrees F, and the average frost-free period is about 75 days.

This unit is about 45 percent Valmar extremely stony silt loam and about 30 percent Hades gravelly silt loam. The Valmar soil is on mountain ridges and on convex side slopes, and the Hades soil is on dominantly east-facing mountainsides and in concave areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Camelback gravelly silt loam on slightly convex side slopes, about 5 percent is Moonlight silt loam in concave areas near drainageways, and about 5 percent is Cedarhill very cobbly silt loam, high precipitation, on and near limestone or dolomite ridgetops. The remaining 5 percent is small areas of Rock outcrop, Ridgecrest extremely stony silt loam, a very deep soil that is similar to the Hades soil and is along drainageways, and a soil that is similar to the Valmar soil but has an extremely bouldery surface layer.

The Valmar soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived from quartzite. Typically, the surface layer is dark brown and brown extremely stony silt loam 9 inches thick. The upper 5 inches of the subsoil is yellowish brown very stony silt loam, and the lower 10 inches is yellowish brown extremely stony silt loam. Quartzite is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

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

The Hades soil is very deep and well drained. It formed in mixed alluvium derived from loess and quartzite. Typically, the surface layer is dark grayish brown and dark brown gravelly silt loam 7 inches thick. The upper 7 inches of the subsoil is dark brown gravelly silt loam, and the lower part to a depth of 60 inches or more is brown, yellowish brown, and light yellowish brown gravelly silty clay loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the unit is mainly bluebunch wheatgrass, Nevada bluegrass, and mountain big sagebrush. Use of mechanical equipment such as rangeland plows and drills is not practical because of the steepness of slope and the extremely stony surface of the Valmar soil. Nonmechanical treatment practices may be more suitable. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas.

This map unit is in capability subclass VIIe.

118—Valmar, cool-Rock outcrop complex, 20 to 60 percent slopes. This map unit is on mountainsides and ridges. The native vegetation is mainly an overstory of small trees and an understory of shrubs and grasses. Elevation is about 5,500 to 7,000 feet. The average annual precipitation is about 18 inches, the average annual air temperature is about 41 degrees F, and the average frost-free period is about 75 days.

This unit is about 60 percent Valmar extremely stony silt loam, cool, and about 25 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Camelback extremely stony silt loam on slightly concave side slopes and about 5 percent is Sedgway gravelly silt loam on north- and east-facing, concave side slopes. The remaining 5 percent is small areas of soils that have slopes of less than 20 percent and soils that are similar to the Valmar soil but have an extremely bouldery silt loam surface layer.

The Valmar soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from quartzite and other related metamorphic rock. Typically, the surface layer is dark brown and brown extremely stony silt loam 9 inches thick. The upper 5 inches of the subsoil is yellowish brown very cobbly silt loam, and the lower 10 inches is yellowish brown extremely stony silt loam. Quartzite is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

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

Rock outcrop consists of areas of exposed fractured quartzite and small areas of limestone or dolomite. It can occur anywhere in this unit, but generally it is on convex side slopes and ridges.

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the Valmar soil is mainly curlleaf mountainmahogany, mountain big sagebrush, bluebunch wheatgrass, Nevada bluegrass, and slender wheatgrass. Use of forage by livestock in some areas of this unit is limited by steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical because of the steepness of slope, the extremely stony surface of the Valmar soil, and the areas of Rock outcrop.

This map unit is in capability subclass VIIs.

119—Valmar, low precipitation-Watercanyon-Hondoho complex, 20 to 50 percent slopes. This map unit is on mountainsides. The native vegetation is mainly shrubs and grasses. Elevation is about 4,500 to 6,500 feet. The average annual precipitation is about 16 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 85 days.

This unit is about 30 percent Valmar very cobbly silt loam, low precipitation, about 25 percent Watercanyon silt loam, and about 20 percent Hondoho cobbly silt loam. The Valmar soil is on the upper part of north- and east-facing mountainsides, the Watercanyon soil is on loess-covered mountainsides, and the Hondoho soil is on south- and west-facing side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 25 percent of the total acreage of this unit. Of this, about 10 percent is Rexburg silt loam on loess-covered, north- and east-facing side slopes at the lower elevations in the unit and about 5 percent is shallow soils that are similar to the Valmar soil and are on ridgetops. The remaining 10 percent is small areas of Rock outcrop, Moonlight silt loam, soils that have slopes of less than 20 percent, and a very deep soil in drainageways.

The Valmar soil is moderately deep and well drained. It formed in alluvium, colluvium, and residuum derived dominantly from quartzite. Typically, the surface layer is dark brown and brown very cobbly silt loam 9 inches

thick. The upper 5 inches of the subsoil is yellowish brown very cobbly silt loam, and the lower 10 inches is yellowish brown extremely stony silt loam. Quartzite is at a depth of 24 inches. Depth to bedrock ranges from 20 to 40 inches.

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

The Watercanyon soil is very deep and well drained. It formed in loess and alluvium derived from loess. Typically, the surface layer is pale brown calcareous silt loam 7 inches thick. The subsoil is pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, light gray, and very pale brown, calcareous silt loam.

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

The Hondoho soil is very deep and well drained. It formed in mixed alluvium. Typically, the surface layer is grayish brown cobbly silt loam 8 inches thick. The subsoil is brown, calcareous cobbly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very cobbly sandy clay loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the Valmar soil is mainly bluebunch wheatgrass, Nevada bluegrass, and mountain big sagebrush. The potential natural plant community on the Watercanyon soil is mainly bluebunch wheatgrass, Thurber needlegrass, arrowleaf balsamroot, and mountain big sagebrush. The potential natural plant community on the Hondoho soil is mainly bluebunch wheatgrass and mountain big sagebrush. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Use of mechanical equipment such as rangeland plows and drills is not practical because of the steepness of slope and the very cobbly surface of the Valmar soil. Livestock watering facilities need to be developed or improved for summer and fall use of this unit.

This map unit is in capability subclass VIIe.

120—Watercanyon silt loam, 12 to 20 percent slopes. This very deep, well drained soil is on foothills and fan terraces. It formed in loess and in alluvium derived from loess. The native vegetation is mainly shrubs and grasses. Elevation is about 4,500 to 5,500 feet. The average annual precipitation is about 12 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 95 days.

Typically, the surface layer is pale brown, calcareous silt loam 7 inches thick. The subsoil is pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, light gray, and very pale brown, calcareous silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Rexburg silt loam on north- and east-facing side slopes and in concave pockets and about 5 percent is Cedarhill very cobbly silt loam on south- and west-facing side slopes. The remaining 5 percent is small areas of soils that have slopes of less than 12 percent or more than 20 percent.

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

Most areas of this unit are used as rangeland. A few areas are used for homesite development.

This unit is well suited to use as rangeland. The potential natural plant community on the unit is mainly mountain big sagebrush, bluebunch wheatgrass, Thurber needlegrass, and arrowleaf balsamroot. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. This unit is suited to the use of mechanical equipment such as rangeland plows and drills. The main limitation is the very high hazard of water erosion. Nonmechanical treatment practices may be more suitable.

Population growth has resulted in increased construction of homes on this unit. The main limitations for homesite development are slope and susceptibility to erosion. Slope is a concern in installing septic tank absorption fields. Access roads should be designed to provide adequate cut-slope grade, and drains are needed to control surface runoff and keep soil losses to a minimum. Preserving the existing plant cover during construction helps to control erosion. The risk of erosion is increased if the soil is left exposed during site development. Erosion is controlled and maintenance costs reduced by stabilizing areas that have been disturbed.

This map unit is in capability subclass IVe.

121—Watercanyon-Swanner-Rock outcrop complex, 20 to 50 percent slopes. This map unit is on mountainsides and ridges. The native vegetation is mainly shrubs and grasses. Elevation is about 4,500 to 6,000 feet. The average annual precipitation is about 13 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 95 days.

This unit is about 40 percent Watercanyon silt loam, about 30 percent Swanner extremely stony loam, and about 15 percent Rock outcrop. The Watercanyon soil is

on loess-covered slopes, the Swanner soil is dominantly on ridgetops and near escarpments and cliffs, and the Rock outcrop is on ridgetops and the upper part of slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Hondoho cobbly silt loam on slightly concave, north- and east-facing side slopes and about 5 percent is Cedarhill very cobbly silt loam on concave, south- and west-facing side slopes. The remaining 5 percent is small areas of Rexburg silt loam, soils that have slopes of less than 20 percent or more than 50 percent, and talus.

The Watercanyon soil is very deep and well drained. It formed in loess and in alluvium derived from loess. Typically, the surface layer is pale brown, calcareous silt loam 7 inches thick. The subsoil is pale brown, calcareous silt loam 9 inches thick. The substratum to a depth of 60 inches or more is pale brown, light gray, and very pale brown, calcareous silt loam.

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

The Swanner soil is shallow and well drained. It formed in loess, silty alluvium, and material weathered from andesite. Typically, the surface layer is dark brown extremely stony loam 9 inches thick. The subsoil is yellowish brown extremely stony loam 8 inches thick. Andesite is at a depth of 17 inches. Depth to bedrock ranges from 10 to 20 inches.

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

Rock outcrop consists of areas of exposed bedrock, mainly fractured andesite. It is nearly vertical cliffs in some areas.

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the Watercanyon soil is mainly bluebunch wheatgrass, Thurber needlegrass, arrowleaf balsamroot, and mountain big sagebrush. The potential natural plant community on the Swanner soil is mainly low sagebrush and bluebunch wheatgrass. Use of forage by livestock in some areas of this unit is limited by the steepness of slope. This may result in overuse of the less sloping areas adjacent to the steeper areas. Livestock watering facilities need to be developed or improved for summer and fall use of this unit. Use of mechanical equipment such as rangeland plows and drills is not practical on the unit because of the steepness of slope, the areas of Rock outcrop, and the extremely stony surface of the Swanner soil.

This map unit is in capability subclass VIIs.

122—Wursten gravelly silt loam, 1 to 4 percent slopes. This very deep, well drained soil is on stream terraces and fan terraces. It formed in alluvium derived from mixed sources. The vegetation in areas not cultivated is mainly shrubs and grasses. Elevation is about 4,600 to 5,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 44 degrees F, and the average frost-free period is about 90 days.

Typically, the surface layer is grayish brown, calcareous gravelly silt loam 9 inches thick. The upper 24 inches of the underlying material is light gray and very pale brown, calcareous gravelly loam, and the lower part to a depth of 60 inches or more is very pale brown, calcareous gravelly silt loam.

Included areas make up about 15 percent of the total acreage of this unit. Of this, about 5 percent is Cedarhill very gravelly silt loam, high precipitation, in slightly convex areas and about 5 percent is Arbone silt loam in concave areas. The remaining 5 percent is small areas of Hondoho gravelly silt loam, Ririe silt loam, Watercanyon silt loam, and soils that have slopes of more than 4 percent.

Permeability of this Wursten soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. If this soil is irrigated, runoff is medium and the hazard of water erosion is moderate.

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

This unit is suited to irrigated crops. It is used for the production of wheat, barley, and alfalfa hay. It is limited mainly by the hazard of water erosion and the gravelly surface of the soil. Sprinkler irrigation is a suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Leaving crop residue on or near the surface helps to conserve moisture, maintain tilth, and control erosion.

This unit is suited to nonirrigated crops. It is used for the production of wheat and barley. It is limited mainly by low precipitation, hazard of water erosion, and the gravelly surface of the soil. Because precipitation is marginal for annual cropping, the cropping system usually includes small grain and summer fallow. Erosion is reduced if fall grain is seeded early, stubble mulch tillage is used, and tillage and seeding are on the contour or across the slope. Also, waterways should be shaped and seeded to perennial grass. On long slopes, chiseling the stubble in fall slows runoff and reduces soil loss in years when the snow melts rapidly while the soil is still frozen. Chiseling also promotes better aeration. Maintaining 1,500 pounds or more of straw on the surface at planting time reduces runoff, conserves

moisture, and helps to maintain soil tilth and organic matter content.

This unit is very susceptible to the formation of a tillage pan and other compacted layers, which reduce the permeability of the soil and restrict root penetration. Deep subsoiling in fall helps to break up the compacted layers.

This unit is well suited to use as rangeland. The potential natural plant community is mainly bluebunch wheatgrass, Wyoming big sagebrush and Nevada bluegrass. The unit is well suited to rangeland seeding.

This map unit is in capability subclasses IIIe, irrigated, and IIIc, nonirrigated.

123—Wursten-Watercanyon Variant-Hondoho complex, 12 to 40 percent slopes. This map unit is on terraces. The native vegetation is mainly shrubs and grasses. Elevation is about 4,600 to 5,000 feet. The average annual precipitation is about 14 inches, the average annual air temperature is about 43 degrees F, and the average frost-free period is about 90 days.

This unit is about 30 percent Wursten gravelly silt loam, about 30 percent Watercanyon Variant silt loam, and about 20 percent Hondoho cobbly silt loam. The Wursten soil is in nearly plane to concave areas, the Watercanyon Variant soil is on convex side slopes, and the Hondoho soil is on north- and east-facing, concave to nearly plane side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included areas make up about 20 percent of the total acreage of this unit. Of this, about 5 percent is Bear Lake silt loam in concave areas along drainageways, about 5 percent is Downey gravelly silt loam near the upper part of terrace breaks, and about 5 percent is a soil that is similar to the Watercanyon Variant soil but has a cemented pan at a depth of 20 to 40 inches. The remaining 5 percent is small areas of tufa outcrops, Ririe silt loam, Lanoak silt loam, and soils that have slopes of less than 12 percent or more than 40 percent.

The Wursten soil is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown, calcareous gravelly silt loam 9 inches thick. The upper 24 inches of the underlying material is light gray and very pale brown, calcareous gravelly loam, and the lower part to a depth of 60 inches or more is very pale brown, calcareous gravelly silt loam.

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

The Watercanyon Variant soil is very deep and well drained. It formed in silty sediment. Typically, the surface layer is pale brown, calcareous silt loam 4 inches thick. The upper 7 inches of the underlying material is white, calcareous silt loam, and the lower part to a depth of 60 inches or more is very pale brown, calcareous silt loam.

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

The Hondoho soil is very deep and well drained. It formed in mixed alluvium. Typically, the surface layer is grayish brown cobbly silt loam 8 inches thick. The subsoil is brown, calcareous cobbly silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown and pale brown, calcareous very cobbly loam.

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

This unit is used as rangeland.

This unit is suited to use as rangeland. The potential natural plant community on the Wursten soil is mainly bluebunch wheatgrass, Nevada bluegrass, and Wyoming big sagebrush. The potential natural plant community on the Watercanyon Variant soil is mainly alkali bluegrass and Wyoming big sagebrush. The potential natural plant community on the Hondoho soil is mainly bluebunch wheatgrass and mountain big sagebrush. The production of forage is limited by the high salt content of the Watercanyon Variant soil. Mechanical equipment such as rangeland plows and drills is suitable for use in areas of this unit that have slopes of less than 20 percent, but its use in the steeper areas is limited by the very high hazard of erosion. The suitability of this unit for rangeland seeding is poor. The main limitation is the high salt content of the Watercanyon Variant soil.

This map unit is in capability subclass VIe.

Prime Farmland

In this section, prime farmland is defined and discussed and the prime farmland soils in the survey area are listed.

Prime farmland is of major importance in providing the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, seed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. Adequate moisture and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal units of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland.

Prime farmland soils commonly get an adequate and dependable supply of moisture from precipitation or irrigation. Temperature and growing season are favorable, and level of acidity or alkalinity is acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not flooded during the growing season. The slope is no more than 4 percent.

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland soils if the limitations are overcome by drainage, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

About 53,059 acres, or nearly 11 percent of the survey area, meets the requirement for prime farmland. This acreage is scattered throughout the survey area, but most of it is in general soil map units 3 and 5. About 95 percent of this prime farmland is used for crops and pasture. The rest is rangeland. The main crops grown are wheat, barley, and alfalfa hay in the nonirrigated areas and wheat, barley, potatoes, alfalfa hay, and grass for pasture in the irrigated areas. The major irrigated areas are north of Pocatello and in the Downey, Arimo, and Robin areas.

A recent trend in land use in the Pocatello and Lava Hot Springs areas has been the loss of prime farmland to urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, are more difficult to manage, and generally are less productive.

The following map units meet the soil requirements for prime farmland. On some soils included in the list, measures have been used to overcome a hazard or limitation, such as flooding, wetness, or droughtiness. Those that require irrigation to be prime farmland are preceded by an asterisk. The location of each map unit is shown on the detailed soil maps at the back of this publication. Soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

1 Arbone silt loam, 1 to 4 percent slopes
6 Arimo silt loam, 0 to 3 percent slopes
*7 Bahem silt loam, 0 to 2 percent slopes
*8 Bahem silt loam, 2 to 4 percent slopes
*21 Broxon silt loam, 0 to 2 percent slopes
*22 Broxon silt loam, 2 to 4 percent slopes
*42 Downey-Arimo complex, 0 to 3 percent slopes
*52 Holmes gravelly loam, 1 to 4 percent slopes
57 Inkom silt loam, drained, 0 to 1 percent slopes
62 Joes silt loam, 1 to 4 percent slopes
64 Joevar silt loam, 0 to 3 percent slopes
65 Lanoak silt loam, 1 to 4 percent slopes
*77 McDole-McDole Variant complex, 0 to 2 percent slopes
*87 Pocatello silt loam, 1 to 4 percent slopes
93 Rexburg silt loam, 1 to 4 percent slopes
97 Ririe silt loam, 1 to 4 percent slopes
122 Wursten gravelly silt loam, 1 to 4 percent slopes

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

By David L. Curtis, district conservationist, Soil Conservation Service

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

The survey area has about 181,885 acres of cropland, hayland, and pastureland. Of this, about 127,085 acres is nonirrigated cropland, about 37,850 acres is irrigated cropland, and about 16,950 acres is hayland and pastureland. Most of the farms and ranches in the area have a combination farming and livestock operation.

Field crops suited to the soils and climate of the nonirrigated part of the survey area include wheat and barley. A small amount of alfalfa is grown for hay, but yields are limited by the shortage of available moisture during the summer. The main crops produced in the irrigated areas are potatoes, wheat, and barley. The farmers that have livestock also raise alfalfa hay and pasture.

About 8,155 acres of the hayland and pasture is wet and semiwet meadow areas. The majority of these areas are located along Marsh Creek, the Portneuf River, and Swan Lake. Soils that are representative of the soils in these areas are Bear Lake, Bear Lake Variant, Downata, and Tendoy soils.

The cropping sequence on the majority of the nonirrigated cropland is a summer fallow-wheat rotation. Another rotation that is used is a three-year rotation of winter wheat followed by spring wheat or barley and then summer fallow. Recently, annual cropping has become more popular, especially in the areas of higher precipitation.

Loss of the surface layer through erosion is a serious problem on the gently sloping to moderately steep cropland soils. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially critical on soils, such as those of the Arbone, Pocatello, Ririe, and Watercanyon series, that have alkaline layers near the surface. Soil eroded from areas of cropland results in sediment entering streams, reducing the quality of water for municipal use, for recreation, and for fish and wildlife.

Erosion control measures are designed to provide a protective cover for the soil surface, to reduce runoff, and to increase water infiltration. A cropping system that keeps plant cover on the soil surface reduces soil erosion losses to amounts that do not reduce the productive capacity of the soils. Grasses and legumes included in the crop rotation help to control soil erosion

and maintain soil fertility and tilth. Soils with good tilth are granular and porous and have a high water infiltration rate. Minimum tillage and no-till practices help to reduce soil compaction and maintain soil tilth. Maintaining a minimum of 1,500 pounds of crop residue per acre on the soil surface at planting time also increases infiltration and reduces runoff and soil erosion.

Terraces and diversions reduce the length of slopes which helps reduce runoff and soil erosion. They are most practical on very deep, well drained soils that have uniform slopes of as much as about 12 to 15 percent. Soils such as the Arbone, Rexburg, Ririe, Lanoak, and Bancroft soils are suitable for terraces and diversions. Contour farming, cross-slope farming, divided-slope farming, and stripcropping are also soil erosion control practices that are suitable for use in the survey area.

Information on the design of soil erosion control measures for each kind of soil is available in local offices of the Soil Conservation Service.

Irrigation water is supplied from local streams, ponds, wells, and irrigation company canals. Sprinkler irrigation is the most widely used method of applying water on the irrigated cropland. Surface irrigation is the most widely used method of applying water on pastureland and the meadowland along Marsh Creek. Applications of irrigation water should be adjusted to the available water capacity of the soil, the water intake rate, and the crop needs.

Soil drainage and protection from flooding are the major management needs on only a small percentage of the acreage in the survey area used for crops, meadow hay, and pasture. Soils such at the Bear Lake, Bear Lake Variant, Downata, Inkom, and Tendoy soils have a seasonal high water table or are subject to flooding.

Most of the soils in the survey area that are used for crops have a silt loam surface layer that has a low to moderate content of organic matter. Regular additions of crop residue and manure, if available, can help to maintain or increase the organic matter content of the soil and help to improve soil structure. Soils that have adequate organic matter content and good structure have good tilth, a high available water capacity, and a good water intake rate.

Crops, hay, and pasture will generally respond to applications of fertilizer. Potatoes, wheat, barley, and grass for pasture will respond to applications of nitrogen fertilizer. Phosphorus is beneficial for legumes, especially on irrigated soils. Much heavier rates of application of fertilizer should be used on irrigated soils than on nonirrigated soils. On all soils, the addition of fertilizer should be based on the results of soil tests, the need of the crop grown, and the expected level of yields. On nonirrigated soils, the available moisture content should also be considered in determining the rate of fertilizer application. A good fertilization program is essential for high production.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*16*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider

possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Rangeland

By John Davis, range conservationist, Soil Conservation Service

Of the 504,610 acres in this survey area, approximately 55 percent, or 275,862 acres, is noncultivated land used primarily for the production of forage for livestock. About 15 percent, or 74,700 acres, is public land managed by the Bureau of Land Management; 9 percent, or 46,468 acres, is State of Idaho Endowment (school) Land under the management of the Idaho Department of Lands; and 31 percent, or 154,694 acres, is privately owned land. Practically all of this land is classified as rangeland or grazeable woodland.

The most common livestock enterprise is the cow-calf operation. There are also some dairy, purebred beef cattle, and sheep ranches in the area. Some of the federal range is used by operators not based within the survey area.

The forage produced on the rangeland at the lower elevations is used primarily in spring and fall. The forage produced on the grazeable woodland and the rangeland above 5,800 feet elevation is used in summer.

The native vegetation in many areas of rangeland at lower elevations has been severely depleted by excessive use in the past. Even when protected from grazing, the more desirable native plants are very slow to increase because of the low precipitation in the area. The productivity of these desirable native plants is one-third to one-half of the amount originally produced.

The areas of rangeland and grazeable woodland at the higher elevations are not so severely depleted as those at the lower elevations. The production in these areas varies from one-half to three-fourths of the amount originally produced. If properly managed, this land will return more rapidly to the near-original production and composition because it receives more precipitation than does the land at the lower elevations.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 6 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in table 6 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally

can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal water table are also important.

Each range site is named using general soil or topographic connotations and mean annual precipitation. This is followed by a range site number to identify the range site in lieu of its name. These numbers are used primarily to coordinate range sites within and between states. *011BY003I* is an example of such a number. This describes the range site as located in major land resource area *011*, subdivision *B* (if there is no subdivision, an *X* will appear in this space). Some states make a further subdivision of their resource areas. Because Idaho does not, a *Y* will always appear in the range site name. The *003* is the coordinated range site number. The letter *I* represents the State of Idaho. Land resource area subdivision maps are available in local offices of the Soil Conservation Service.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods. All herbage utilized or unutilized by livestock and wildlife is included. The amount that can be used as forage depends on the kinds of grazing animals and the season when the forage is grazed.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Woodland Management and Productivity

The woodland resource in the survey area is in the more mountainous parts of the area. The location, extent, and species composition of the woodland areas are directly related to the actual and effective precipitation received. Aspect and elevation are the main factors that influence precipitation.

At the lower elevations, about 5,500 feet, quaking aspen and Douglas-fir are restricted to concave, north- and east-facing side slopes. With an increase in elevation and the related increase in precipitation, quaking aspen and Douglas-fir spread to cover nearly all of the north- and east-facing side slopes. At about 6,000 feet, quaking aspen and Douglas-fir are on concave, south- and west-facing side slopes and lodgepole pine and subalpine fir are on the concave, north- and east-facing side slopes. Above 6,500 feet, there are moderately extensive stands of timber; Douglas-fir occupies the slightly drier and warmer, convex positions, and lodgepole pine and subalpine fir occupy the cooler and more moist, concave positions.

The more extensive areas of woodland in the survey area are (1) the Buckskin area, east of Pocatello, (2) the Garden Creek and Big Onion area, along the western boundary of the survey area, and (3) the Cottonwood area, east of Downey and south of Lava Hot Springs. The Cottonwood area is the most extensive of the timbered areas.

In the early development of the area, the woodland provided lumber for local construction, posts and poles for fences, firewood, and a considerable quantity of railroad ties. There is still some logging taking place, but it is severely limited by the distance to sawmills or pole plants. The locally grown timber, at present, is used mainly for firewood.

Most of the woodland acreage is on steep erodible soils. Logging roads and skid trails must be carefully planned and constructed to provide adequate drainage and prevent excessive soil erosion. Upon completion of timber harvesting, roads, skid trails, and landings should

be provided with water bars and seeded to adapted plant species.

The map unit descriptions in the section "Detailed Soil Map Units" provide a brief discussion of soil-, harvesting-, and production-related limitations. Maximum average annual growth, expressed in cubic feet per acre, is also given for one or more tree species. These growth figures are based on data from yield tables and are ascertained by using the average site indexes. The site indexes are determined by using the appropriate site index curves (*1, 2, 5, 6, 7, 10*) for each tree species. For Douglas-fir, the site indexes obtained from Brikell's curves have been converted to a 100-year base so that Meyer's yield tables could be used to determine growth. The growth figures, when more than one species is given for a soil, are not cumulative. Instead they represent the potential maximum average annual growth, assuming that only one tree species is present.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the ordination symbol, a number, indicates the potential productivity in cubic meters of wood per hectare per year for important tree species. One cubic meter per hectare is equal to 14.3 cubic feet per acre. Yields in the map unit descriptions in the section "Detailed Soil Map Units" are given in cubic feet per acre per year.

The second part of the symbol, a capital letter, indicates the major kind of soil or physiographic characteristic that contributes to important hazards or limitations in management. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excessive water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, high content of rock fragments in the soil profile. The letter *A* indicates that limitations or restrictions are insignificant. Some kinds of soil may have more than one limiting characteristic, but only one symbol will be used. The priority rating is as follows: R, X, W, T, D, C, S, and F.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Woodland Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Table 8 shows, for each soil suitable for woodland use, the potential for producing understory vegetation. The *total production* of understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4 1/2 feet. It is expressed in pounds per acre of air-dry vegetation in favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Table 8 also lists the common names of the *characteristic vegetation* on each soil and the percentage *composition*, by air-dry weight, of each kind of plant. The table shows the kind and percentage of understory plants expected under a canopy density that is most nearly typical of woodland in which the production of wood crops is highest.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition. The plants should be irrigated for at least the first two summers after planting.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils under irrigation. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Some of the trees and shrubs listed in the table will grow without irrigation but growth will be reduced. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Recreation

The survey area provides many opportunities for year-round outdoor recreation. These include hunting, fishing, swimming, camping, hiking, and winter sports.

The farmland areas provide good hunting for upland game birds such as ring-necked pheasant and Hungarian partridge. Mule deer and grouse hunting is good in the mountains and foothills. Waterfowl are plentiful along Marsh Creek, the Portneuf River, and Swan Lake.

The Portneuf River provides good fishing for rainbow, brown, and cutthroat trout. Some of the smaller tributary streams have rainbow and eastern brook trout. Hawkins and Wiregrass Reservoirs provide very good fishing for rainbow trout, especially early in summer.

Natural hot springs provide hot water for hot pools and swimming pools at Lava Hot Springs and a swimming pool at Downata. There are several private campgrounds within the survey area and several public campgrounds just outside the area.

There are two downhill skiing areas—Caribou, which is just east of Pocatello, and Pebble Creek, which is east of Inkom, just outside the survey area. Most of the survey area offers opportunities for snowmobiling and cross-country skiing.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for dwellings without basements and for local roads and streets in table 12 and interpretations for septic tank absorption fields in table 13.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. the best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

By Mike W. Anderson, biologist, Soil Conservation Service

The survey area supports many kinds of wildlife. The areas of woodland, rangeland, cultivated fields, and water provide food and cover for many mammals, birds, and fish.

Mule deer are the most abundant of the big game animals, but there are also some elk and a few moose. Beaver, mink, muskrat, and other furbearers live along the streams and in the marshes.

Waterfowl use the meadows and marshes and the Portneuf River and Marsh Creek during the migration and nesting seasons, and they feed in nearby fields. Approximately 9,000 acres of wetland provides habitat for Canada goose, mallard, pintail, gadwall, redhead, American wigeon, green-winged teal, blue-winged teal, and cinnamon teal. Numerous less common waterfowl species, shore birds, and other water-loving birds also live in and use these areas.

The survey area offers a good variety of upland game species that use almost all of the different habitat types in the area. Some species, such as the pheasant and mourning dove, are closely associated with the private farmlands; others, such as the sage grouse, Hungarian partridge, sharp-tailed grouse, and rabbits, are more dependent on the rangeland. Ruffed grouse and blue grouse are in areas of forest land.

The wildlife population is largely determined by the suitability of the habitat; that is, the supply of food, cover, and water. Habitats differ in their capacity to provide these essential needs. Some of these differences are because of the characteristics of the soils, and others are a result of management. To improve the habitat for wildlife, good management practices are needed. They should be integrated with other uses of the soils.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. These ratings are for either irrigated or nonirrigated conditions, based on the major use of the soil. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, wheatgrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluegrass, goldenrod, beggarweed, wheatgrass, and wildrye.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are mountainmahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, saltgrass, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Hungarian partridge, ring-necked pheasant, meadowlark, mourning dove, coyote, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, blue grouse, owl, woodpecker, squirrel, elk, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, sandhill crane, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include coyote, mule deer, jackrabbit, sage grouse, meadowlark, and sharp-tailed grouse.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to

bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that

special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage because of rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of

sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to

overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

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