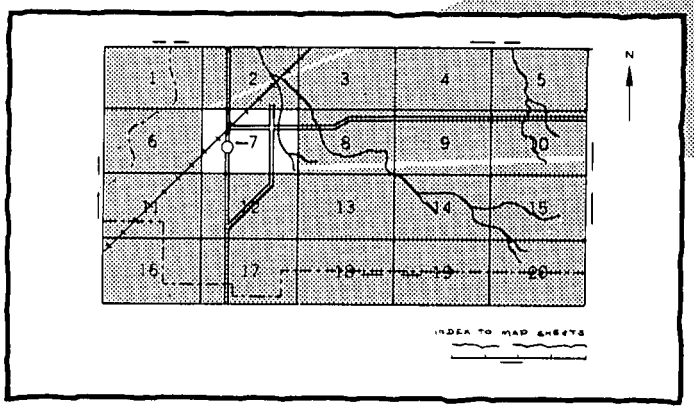
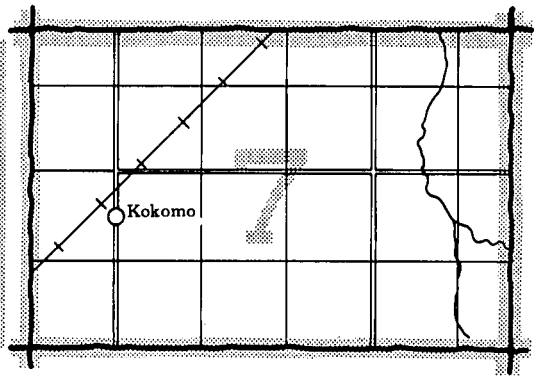
SOIL SURVEY OF
Fremont County, Wyoming
Lander Area

United States Department of Agriculture
Soil Conservation Service
In cooperation with
University of Wyoming Agricultural Experiment Station

HOW TO USE

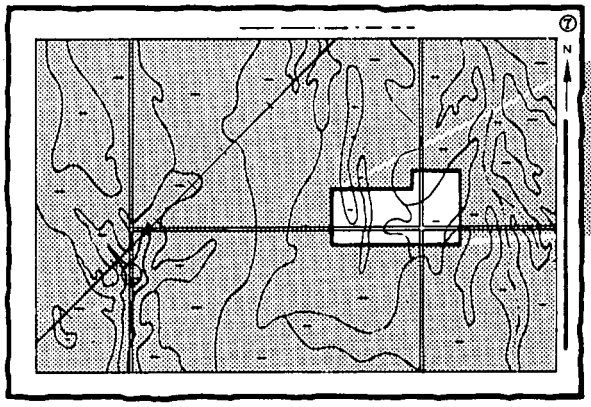
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

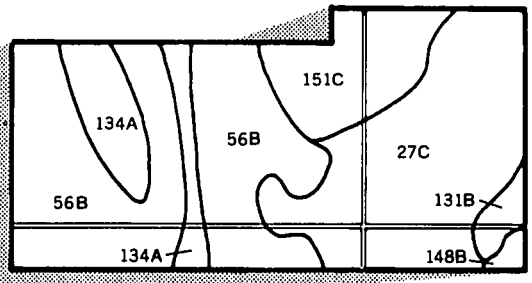




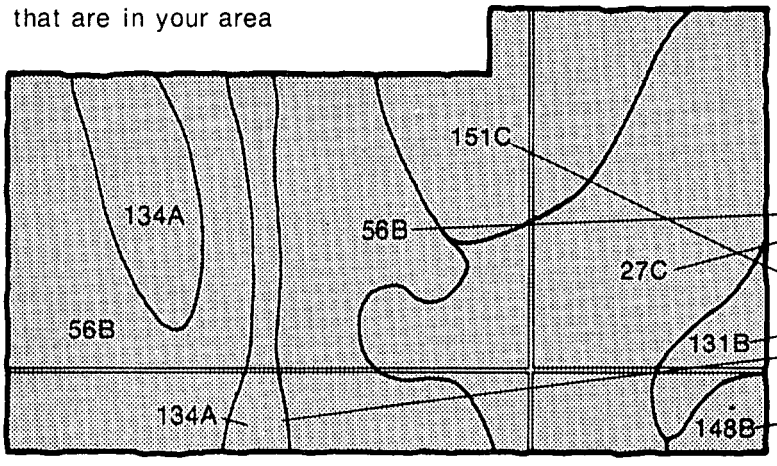
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.





4. List the map unit symbols that are in your area

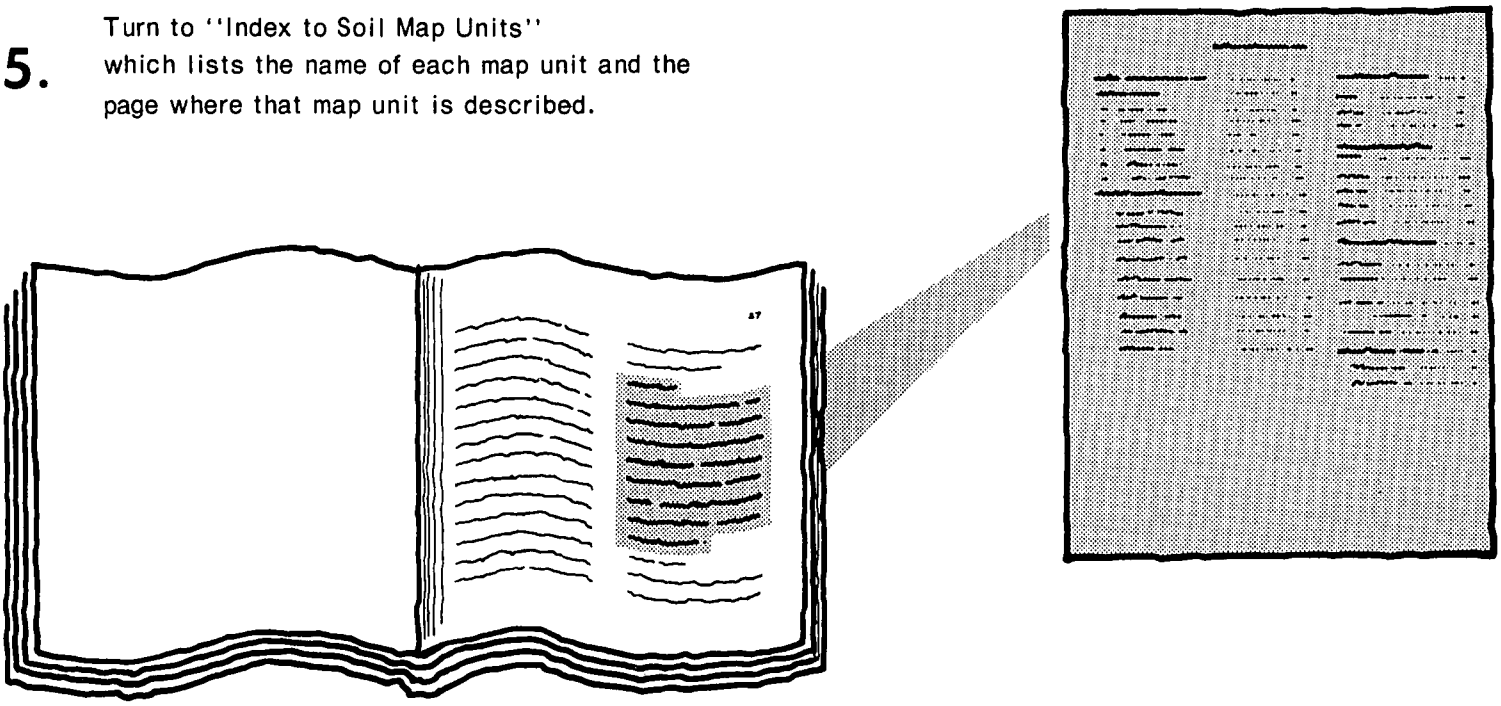


Symbols

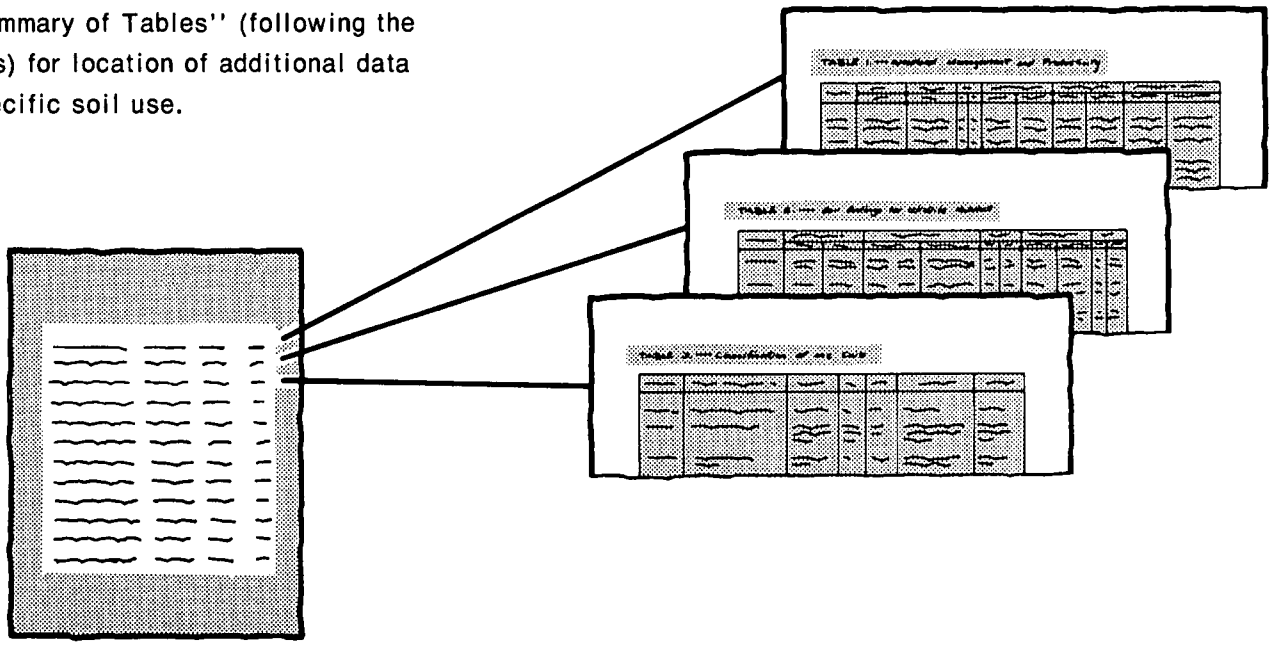
- 27C
- 56B
- 131B
- 134A
- 148B
- 151C

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 is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. 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 the period 1967-74. Soil names and descriptions were approved in 1975. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1975. This survey was made cooperatively by the Soil Conservation Service and the University of Wyoming Agricultural Experiment Station. It is part of the technical assistance furnished to the Popo Agie Conservation District.

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

Cover: Area in Shoshone National Forest south of Lander. Soil is a Handran very stony loam.

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Issued June 1981

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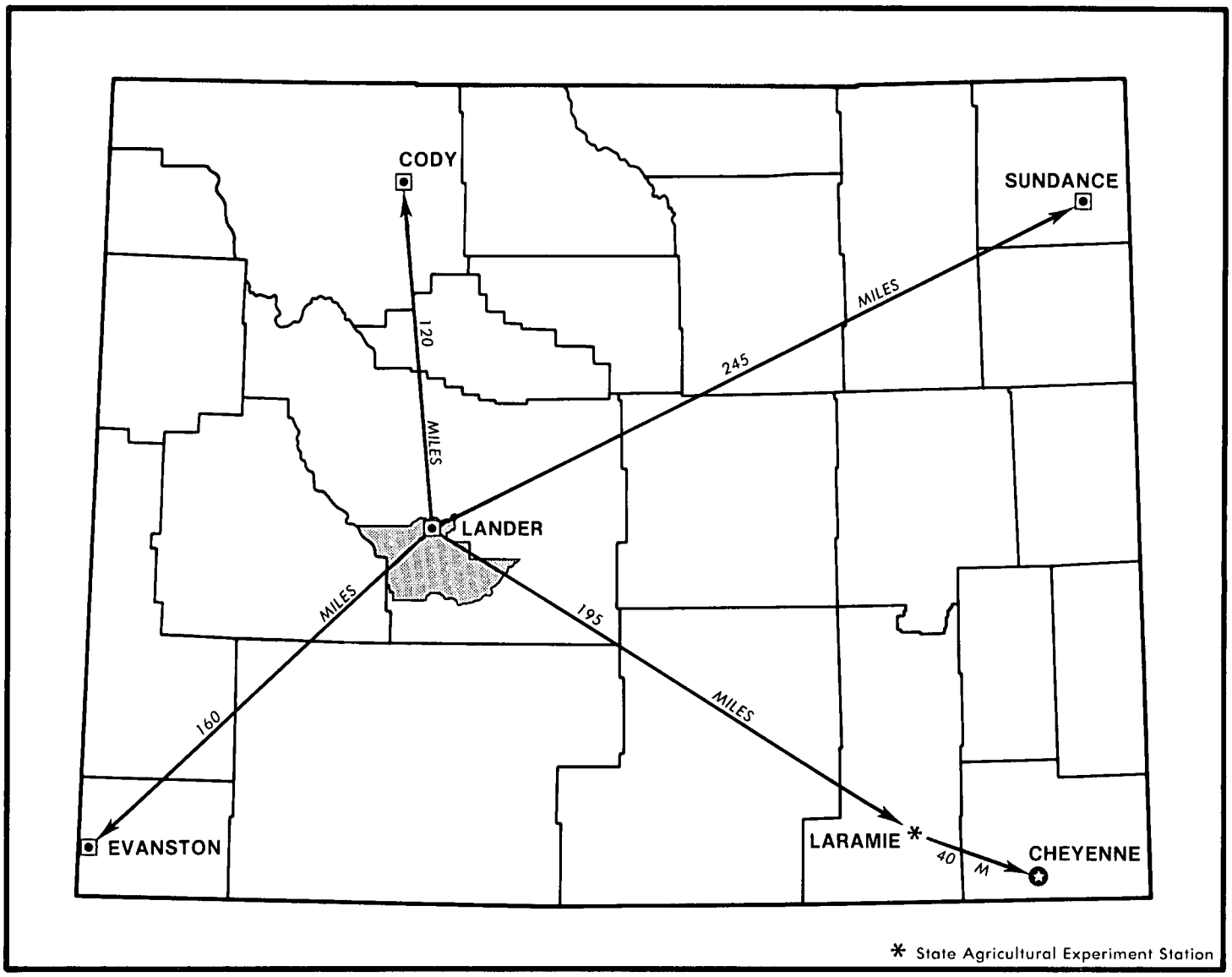

Location of Lander Area in Wyoming.

SOIL SURVEY OF FREMONT COUNTY, WYOMING, LANDER AREA

By Jack F. Young, Soil Conservation Service

Soils surveyed by Jack F. Young, John E. liams, and Robert L. Lebruska, Soil Conservation Service. Clarence J. Fowkes, Soil Conservation Service, assisted in the field correlation.

United States Department of Agriculture, Soil Conservation Service, in cooperation with the University of Wyoming Agricultural Experiment Station

LANDER AREA is in the south-central part of Fremont County, Wyoming (see map on facing page), mainly in the Wind River Mountains and the Wind River Basin. Its area is 616,355 acres, or about 963 square miles. Of this, 279,085 acres is in the Shoshone and Bridger National Forests.

General nature of the area

Settlement, natural resources, physiography, relief, drainage, and climate of the survey area are discussed in this section.

Settlement

Captain B. L. E. Bonneville, reportedly the first explorer in the survey area, came to the area by way of South Pass in 1833. He discovered the tar spring at Derby.

Gold was discovered in the South Pass area in 1842. Mining did not become important until 1860, but by 1868 Miner's Delight had become a boomtown.

Lander, the largest town in the survey area, was settled in 1868 and was incorporated in 1890. It was originally named Pushroot. Camp Auger, later named Camp Brown, was established in 1869 on the south side of Main Street at the Dickinson Creek crossing in what is now Lander. Hudson, a coal mining town for many years, was founded in 1866.

The first farm was established along Barrett Creek in Red Canyon in 1869 by W. A. Barrett. Good soil and ample water attracted farmers who provided vegetables for the miners in the South Pass area.

A modern school system and several churches serve the area. Fire protection is provided by volunteer fire departments in the towns and by rural fire protection districts. The Forest Service and Bureau of Land Management provide fire protection for the lands they administer.

U.S. Highway 287 and Wyoming Highway 789 cross the area. Also, a system of farm-to-market roads, some of which are paved, are in the area.

A local busline provides service to Shoshone and Rawlins where connections can be made with transcontinental bus and rail services. Charter air service is available at Lander.

Telephone service is available in much of the survey area. Electricity is provided for the towns of Lander and Hudson and for rural areas. Natural gas is available in Lander and Hudson.

Natural resources

Soil is the most important resource in the survey area. About 90 percent of the acreage not in national forest is in ranches and farms. About 59,500 acres is irrigated; most of this irrigated acreage is in hay and pasture. The range and irrigated pasture are grazed by cattle and sheep.

Some timber is harvested from the national forests and national resource lands. A small sawmill operates north of Lander.

Water used for irrigation and domestic purposes in the survey area is supplied mainly by the Popo Agie River and its tributaries. It is stored at Frye Lake, Wortham Meadows Reservoir, Shoshone Lake, and Pete's Lake. Springs in the mountains provide water for livestock and vacation homes. Groundwater is limited in the survey area. Deep artesian wells supply water along the boundaries of the Sinkson-Thermopolis and Farlow-Duncom map units described in the section "General soil map for broad land use planning." Other wells are in the alluvium of the Lupinto-Lander map unit.

Taconite, oil, and gravel are mined in the survey area; gold, gypsum, and coal are no longer mined. Taconite mining and milling operations are in Atlantic City, Wyoming. Several oil wells are in the survey area. The Derby oil field, still productive, is the site of the first oil well drilled in Wyoming.

Gravel is mined mainly from Lupinto soils; it can also be extracted from Handran, Midelight, and Leavitt soils. A large supply of gravel is available. Large quantities of gold were mined in the Handran-Midelight map unit;

many abandoned mine shafts and prospect pits remain. Gypsum was extracted from the Gypsum Springs Formation in the Sinkson-Thermopolis map unit.

Physiography, relief, and drainage

The Wind River Mountains are part of the Middle Rocky Mountain province (*3*). They rise steeply from the floor of the Wind River Basin. The Wind River Basin is the western part of the Shoshone Basin, which is a subordinate of the Wyoming Basin. The Shoshone Basin is a long synclinal trough between the Wind River and Rattlesnake Ranges to the south and the Owl Creek and Bridger Mountains to the north. The Shoshone Basin is separated from the Great Plains to the east by the Oil Mountain anticline.

The relief of the survey area is characterized by an uplifted mountain block and associated intermountain basins. The lowest point, about 5,100 feet above sea level, is along the Popo Agie River east of Hudson, on the survey boundary. The highest point is Wind River Peak, elevation 13,200 feet, on the Continental Divide.

The Wind River Range formed during the Laramide Revolution. The Wind River Mountains have a broadly exposed granite core characterized by narrow crests between deep, glaciated gorges. The area is not typical, in that the foothills occur out in the basin away from the mountain front. This relief is the result of geologic processes that began with the formation of the mountains. After the mountains were formed, Tertiary sediments were deposited in the basin. This process was followed by a period of erosion. Next, valley fill of stratified sand, gravel, cobbles, and boulders was deposited. The erosion cycles continued and most of the valley fill was carried away.

Two old valley fill remnants are terraces in the Lander area. One is about 50 feet above downtown Lander and is the site of the Wyoming State Training School. The other is about 150 feet higher and is the site of the airport. Erosion continues; it is more rapid in the soft bedrock of the basin than in the hard bedrock of the mountains.

Most of the survey area drains into the Popo Agie River and its tributaries and Beaver Creek and its tributaries. These are part of the Wind River drainage system. A small area in the southwestern part of the survey area is drained by the Sweetwater River, a tributary of the Platte River system.

Climate

The information in this climate section is based principally on data from the Lander station of the National Weather Service. Table 1 provides temperature and precipitation data recorded at the Lander station from 1941 to 1970.

The Lander station is at an airport on a mesa 200 feet above and 1 1/2 miles south-southeast of the town of Lander. The terrain to the north, east, and south varies from rolling to broken. Grass-covered hills, approximately 400 feet higher than the Lander station, are at a distance of 2 to 5 miles. The foothills of the Wind River Range are about 3 miles west and southwest of the Lander station; the elevation of the Wind River Range is 12,000 feet at a distance of 20 miles from this station.

Mountains to the west of Lander station block moisture from the Pacific Ocean, creating a semiarid climate. The heaviest and most persistent precipitation comes on easterly winds and is the product of the convergence of a low pressure system from the south, commonly over Colorado, and a high pressure system from the north, over Montana or the western Dakotas. The Lander station is subject to 45 percent more precipitation than the area 24 miles to the northeast and 83 percent more than areas 50 miles to the northeast. The total annual precipitation is 13.84 inches; of this total, about 9 inches, or 65 percent, commonly falls during the growing season for most crops—April through September. More than one-third of the annual precipitation is in April and May; a lesser peak period is in September and October. Intermittent and patchy showers provide summer moisture. The heaviest one-day rainfall recorded was 3.56 inches in June 1947. The average seasonal snowfall at Lander is 104 inches. About one-third of the annual snowfall is in March and April; at this time the temperature is comparatively high and the snow melts quickly. The average annual precipitation recorded at Louis Lake Ranger Station, in the south-central part of the survey area, was 27.61 inches for the years of 1964 through 1972. Lander has no distinctive spring season because snow is not uncommon in June; the ninth heaviest snowfall on record, 18.4 inches, blanketed the valley surrounding the town of Lander on June 11 and 12, 1947.

Winds from all directions except northeast, most noticeably the westerlies, blow downslope to the Lander station and produce a Chinook effect. The Lander station is subject to greater wind velocity than is the town of Lander. Windspeed at the Lander station averaged 7 miles per hour during the period 1947-64; windspeed measured at the town of Lander averaged 4.7 miles per hour for the 56 years that data were recorded. Winds are often so light that there is little or no mixing of the cold surface air and the warmer layer 2,000 to 3,000 feet above the valley. Temperature inversions are the rule in winter, at night and early in the morning. For several days each winter, temperatures in the bottom of the valley are 20 to 30 degrees lower than in the surrounding areas, which are subject to higher windspeeds. On calm, clear nights when there is snow cover, temperatures in Lander and the surrounding valley can be as much as 15 degrees lower than at the Lander station. Sheltered locations in the survey area are protected from most of the severe storms that sweep down from Canada.

The prevailing winds are from the southwest. Average windspeed is highest, 8 miles per hour, in April and May.

In winter the average temperature is 23 degrees F, and the average daily low is 11 degrees F. The lowest tem-

perature on record, -37 degrees F, was in January 1963. In summer the average temperature is 67 degrees F, and the average daily high is 82 degrees F. The normal daily range of temperature in summer is about 30 degrees. The highest temperature recorded, 101 degrees F, was in July 1954. The temperature commonly reaches or exceeds 90 degrees F during 15 to 20 days per year. Humidity is low at these times, however, so the heat is not oppressive. Summer nights are cool.

Hardy plants and vegetables grow well in this survey area. The average length of the period between the last freezing temperature in spring and the first in fall is 126 days; however, freezing temperatures have been recorded as late as July 3 and as early as August 22. The average date for the last recorded freezing temperature in spring is May 20, and the average date for the first in fall is September 23.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degrees days accumulate by the amount that the average temperature each day exceeds a base temperature. 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 average relative humidity at 5:00 p.m. is about 43 percent. Humidity is higher at night in all seasons, and the average at dawn is about 64 percent.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

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

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the sections "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of rangeland and woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

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

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it 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 kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The terms for texture used in the descriptive title of the map unit apply to the texture of the surface layer of the major soils. For example, in the Sinkson-Thermopolis

map unit the word "loam" refers to the texture of the surface layer.

Descriptions of soil map units

1. Lupinto-Lander

Deep, nearly level to gently sloping clay loams and loams; on stream terraces and flood plains

The soils in this map unit are deep and well drained to poorly drained. They are on stream terraces and flood plains. Elevation ranges from 5,200 to 5,700 feet. Slopes generally range from 0 to 6 percent; however, soils on terrace breaks slope as much as 30 percent. The soils in this map unit formed in alluvium from mixed sources. Annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This map unit makes up about 3 percent of the survey area. It is about 30 percent Lupinto soils and 22 percent Lander soils. Minor soils make up the remaining 48 percent.

The surface layer of Lupinto soils is grayish brown clay loam 4 inches thick. The subsoil is dark yellowish brown and brown clay loam 9 inches thick. The substratum is very pale brown very gravelly loam to a depth of 60 inches or more.

The surface layer of Lander soils is brown loam 14 inches thick. The underlying material is brown stratified loam to a depth of 60 inches or more.

Among the minor soils in this map unit are Havre soils; Fluvaquents; Fluvents, saline; and Ustic Torrifluvents-Aeric Fluvaquents. All of these soils are on flood plains.

This map unit is used mainly for irrigated hay and pasture, but it is also used for range.

2. Patent-Forelle-Diamondville

Shallow to deep, nearly level to rolling clay loams and sandy clay loams; on uplands and alluvial fans

The soils in this map unit are shallow to deep and well drained. They are on uplands and alluvial fans (fig. 1). Elevation ranges from 5,200 to 7,100 feet. Slopes generally range from 0 to 15 percent; however, some soils along Beaver Rim slope as much as 60 percent. The soils in this unit formed in material weathered from interbedded soft shale, hard shale, and sandstone and in alluvium derived from this material. Annual precipitation is about 13 inches. The mean annual soil temperature is 44 to 46 degrees F. The frost-free season is 90 to 120 days.

This map unit makes up about 27 percent of the survey area. It is about 11 percent Patent soils, 11 percent Forelle soils, 10 percent Diamondville soils, and 9 percent Blazon soils. Minor soils make up the remaining 59 percent.

Patent soils are light brownish gray clay loam to a depth of 60 inches or more.

The surface layer of Forelle soils is grayish brown sandy clay loam 2 inches thick. The subsoil is brown and dark brown clay loam 24 inches thick. The substratum, to a depth of 60 inches or more, is light yellowish brown clay loam.

The surface layer of Diamondville soils is light brownish gray and brown loam 3 inches thick. The subsoil is brown and pale brown clay loam 9 inches thick. The substratum is light gray loam. Sandstone is at a depth of 22 inches.

The surface layer of Blazon soils is light gray clay loam 12 inches thick; it is underlain by shale.

Among the minor soils in this map unit are Blackhall, Carmody, Cotha, Crownest, Havre, Delphill, Elkol, and Highpoint soils, Fluvaquents, and Fluvents, saline; Rock outcrop is also present. Blackhall and Carmody soils are underlain by soft, light-colored, calcareous sandstone and siltstone. Cotha and Crownest soils are underlain by hard, noncalcareous sandstone. Highpoint soils are underlain by weathered shale. Delphill soils are moderately deep and strongly alkaline. They formed on alluvial fans and in filled valleys. Havre soils, Fluvents, saline, and Fluvaquents are in filled valleys and on flood plains. Rock outcrop is on the steeper side slopes.

This map unit is used mainly for range, although most of the irrigated acreage in the survey area is in this map unit. Pasture and hay are the irrigated crops. Sage chickens and many pronghorn antelope inhabit the areas of these soils.

3. Sinkson-Thermopolis

Deep and shallow, gently sloping to steep loams; on alluvial fans and uplands

The soils in this map unit are deep and shallow and well drained. They are along the mountain front and around Sheep Mountain (fig. 2). Elevation ranges from 5,500 to 7,300 feet. Slopes range from 3 to 60 percent. The soils in this unit formed in material weathered from red beds. Annual precipitation is about 13 inches. The mean annual soil temperature is 44 to 46 degrees F. The frost-free season is 90 to 120 days.

This map unit makes up about 8 percent of the survey area. It is about 54 percent Sinkson soils and 31 percent Thermopolis soils. Minor soils make up the remaining 15 percent.

Sinkson soils are red loam to a depth of 60 inches or more.

The surface layer of Thermopolis soils is reddish brown loam 4 inches thick. The underlying material is reddish brown loam 11 inches thick. Siltstone is at a depth of 15 inches.

Among the minor soils in this map unit are Forelle soils, Torrifluvents, Fluvaquents, and soils that are similar to Sinkson soils but are moderately deep; Rock outcrop is also present as ledges and ridges. Forelle soils are on flood plains associated with limestone bedrock. Torrifluvents and Fluvaquents are on flood plains. The Sinkson soil is on uplands.

This map unit is used mainly for range. A small acreage is used for irrigated hay and pasture. Mule deer inhabit areas along the streams.

4. Farlow-Duncom

Shallow to deep, moderately steep to steep channery loams, loams, and fine sandy loams on mountain fronts

The soils in this map unit are shallow, moderately deep and deep, and well drained. They are on the Wind River Mountain front and on Sheep Mountain. Elevation ranges from 6,000 to 9,500 feet. Slopes range from 10 to 60 percent. The soils in this unit formed in material derived from limestone and sandstone. Annual precipitation is 15 to 20 inches. The mean annual soil temperature is 43 to 46 degrees F, and the summer soil temperature is 57 to 59 degrees F. The frost-free season is 60 to 90 days.

This map unit makes up about 21 percent of the survey area. It is about 37 percent Farlow soils, 19 percent Duncom soils, and 14 percent Sapphire soils. Minor soils make up the remaining 30 percent.

The surface layer of Farlow soils is dark grayish brown channery loam 9 inches thick. The next layer is brown very channery loam 8 inches thick. The underlying material is very pale brown channery loam. Limestone is at a depth of 46 inches.

The surface layer of Duncom soils is dark grayish brown loam 5 inches thick. The underlying material is dark grayish brown loam and pale brown channery loam. Limestone is at a depth of 16 inches.

Sapphire soils have 4 inches of needles and twigs over a surface layer of light brownish gray fine sandy loam 10 inches thick. The subsoil is pale brown sandy clay loam 25 inches thick. Sandstone is at a depth of 35 inches.

Among the minor soils in this map unit are a soil that is similar to Farlow soils and that is associated with quartzite and Rock outcrop and a soil in less sloping areas that has better profile development. The soils associated with quartzite are along the boundaries between limestone and granite. Rock outcrop is also present in steep areas.

This map unit is used mainly for range. Some small fields near streams are used for irrigated hay and pasture. Recreation is important in this map unit. Mule deer and elk are the principal wildlife.

5. Rock outcrop-Frisco

Deep, moderately steep to very steep gravelly loams with many rock outcrops; on mountains

This map unit consists of exposed bedrock and soils that are deep and well drained. Areas of this map unit are on mountains (fig. 3). Elevation ranges from 8,000 to over 12,000 feet. Slopes generally range from 10 to more than 65 percent; however, along streams and on some alluvial fans along streams, slopes range from 0 to 10 percent. The Frisco soils formed in granitic alluvium. Annual precipitation is 20 to 40 inches. The mean annual soil temperature is 40 to 42 degrees F, and the mean summer soil temperature is 52 to 54 degrees F. The frost-free season is less than 60 days.

This map unit makes up about 36 percent of the survey area. It is about 50 percent Rock outcrop, 30 percent Frisco soils, 10 percent Handran soils, and 10 percent minor soils.

Frisco soils have 2 inches of needles and twigs over a surface layer of pale brown gravelly loam 6 inches thick. The subsoil is yellowish brown very gravelly clay loam 18 inches thick. The substratum, to a depth of 60 inches or more, is yellowish brown and black very gravelly loam.

The surface layer of Handran soils is brown very stony loam 9 inches thick. The underlying material is light yellowish brown very gravelly coarse sandy loam to a depth of 60 inches or more.

Among the minor soils in this map unit are Silas, Farlow, Duncom, and Sapphire soils and soils that are associated with quartzite and are similar to Farlow soils. Granite detritus is also present. Silas soils are along the major drainageways. Farlow, Duncom, and Sapphire soils and the soils similar to Farlow soils are along the border with the Farlow-Duncom map unit.

The main uses of this map unit are recreation and wildlife habitat. Many lakes and streams provide fishing. Elk, moose, and mule deer are the principal wildlife. Some timber is harvested.

6. Handran-Midelight

Deep, gently sloping to hilly very channery loams; on uplands and mountain foot slopes

The soils in this map unit are deep and well drained. They are on uplands and mountain foot slopes (fig. 4). Elevation ranges from 8,000 to 9,000 feet. Slopes range from 2 to 30 percent. The soils in this map unit formed in alluvium derived from schist. Annual precipitation is 15 to 20 inches. The mean annual soil temperature is 41 to 44 degrees F, and the mean summer soil temperature is 54 to 56 degrees F. The frost-free season is 60 to 90 days.

This map unit makes up about 5 percent of the survey area. It is about 22 percent Handran channery loam, 20 percent Midelight soils, 12 percent Irigul soils, and 8 percent Ansel soils. Minor soils make up the remaining 38 percent.

The surface layer of Handran soils is yellowish brown very stony loam 9 inches thick. The underlying material is light yellowish brown very gravelly coarse sandy loam to a depth of 60 inches or more.

The surface layer of Midelight soils is brown very channery loam 8 inches thick. The underlying material is pale brown very channery loam 32 inches thick. Schist is at a depth of 40 inches.

The surface layer of Irigul soils is grayish brown channery loam 6 inches thick. The underlying material is yellowish brown very channery loam 7 inches thick. Schist is at a depth of 13 inches.

Ansel soils have 2 inches of needles and twigs over a surface layer of light brownish gray loam 5 inches thick. The subsoil is brown clay loam and loam 37 inches thick. The substratum is gray, brown, and light yellowish brown very fine sandy loam to a depth of 60 inches or more.

Among the minor soils in this map unit are Silas, Farlow, and Duncom soils; schist outcrops are also present. Silas soils are along drainageways. Farlow and Duncom soils are over the contact between limestone and schist bedrock.

This map unit is used mainly for range. Many vacation homesites are in the area. The historic South Pass mining area is in this map unit and some mining continues. Mule deer are the principal wildlife; elk and moose are also present.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Lander series, for example, was named for the town of Lander in Fremont County.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Elkol clay loam is one of several phases within the Elkol series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes and soil associations.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Havre complex is an example.

A *soil association* is made up of soils that are geographically associated and are shown as one unit on the map because it is not practical to separate them. A soil association has considerable regularity in geographic pattern and in the kinds of soil that are a part of it. The extent of the soils can differ appreciably from one delineation to another; nevertheless, interpretations can be made for use and management of the soils. Farlow-Duncom association is an example.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Rock outcrop is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 2, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

1—Ansel loam. This soil is very deep and well drained. It is on mountainsides at elevations of 8,000 to 9,000 feet. Slopes range from 15 to 30 percent. This soil formed in alluvium derived from schist. The average annual precipitation is 15 to 20 inches. The mean annual soil temperature is 41 to 44 degrees F, and the mean summer soil temperature is 54 to 56 degrees F. The frost-free season is 60 to 90 days.

The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

In a typical profile a 2-inch-thick organic mulch of pine needles and twigs overlies a surface layer of light brownish gray loam 5 inches thick. The subsoil is brown clay loam and loam 37 inches thick; it has dark gray mottles. The substratum, to a depth of 60 inches or more, is yellowish brown and gray very fine sandy loam.

Included with this soil in mapping are small areas of Handran, Irigul, Silas, and Midelight soils.

Permeability is moderate. Available water capacity is high. Surface runoff is rapid, and the hazard of erosion is severe. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for wooded pasture and recreational purposes. Some acreage is used for permanent residences and vacation homesites. Native vegetation on this soil is lodgepole pine. Some bluegrass and fescue grows in open park areas. Dryland capability subclass VIe.

2—Blackhall-Carmody association. The soils in this association are moderately steep to steep. They are on dissected uplands at elevations of 5,500 to 7,000 feet (fig. 5). Slopes range from 10 to 50 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 35 percent Blackhall gravelly very fine sandy loam, 10 to 50 percent slopes; 25 percent Carmody very fine sandy loam, 10 to 30 percent slopes; and 40 percent included soils and Rock outcrop. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this soil in mapping are areas of Crownest soils, which make up about 15 percent of this map unit. Also included are areas of Diamondville, Patent, and Blazon soils, which make up about 25 percent of this unit.

The Blackhall soil is shallow and well drained. In a typical profile the surface layer is pale brown gravelly very fine sandy loam 5 inches thick. The underlying material is very pale brown gravelly very fine sandy loam. Soft, calcareous sandstone is at a depth of 12 inches.

Permeability of the Blackhall soil is moderate. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is severe. The effective rooting depth is 10 to 20 inches.

The Carmody soil is moderately deep and well drained. In a typical profile this soil is light brownish gray very fine sandy loam. Soft, calcareous sandy siltstone is at a depth of 25 inches.

Permeability of the Carmody soil is moderate. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is severe. The effective rooting depth is 20 to 40 inches.

These soils are used for range. Native vegetation on the Blackhall soils is bluebunch wheatgrass, Sandberg bluegrass, threadleaf sedge, and black sagebrush. Native vegetation on the Carmody soil is western wheatgrass, threadleaf sedge, and black sagebrush. Dryland capability subclass VIe.

3—Blazon-Patent association. The soils in this association are sloping to moderately steep. They are on mountain fronts and ridges in the basin area at elevations of 5,200 to 5,700 feet. Slopes range from 6 to 20 percent but are predominantly 8 to 15 percent. The average annual precipitation is 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 50 percent Blazon clay loam, 6 to 20 percent slopes; 20 percent Patent clay loam, 6 to 20 percent slopes; and 30 percent included soils and Rock outcrop. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Cotha, Diamondville, and Forelle soils. Rock outcrop is also present.

The Blazon soil is shallow and well drained. It is on uplands. In a typical profile the surface layer is light gray clay loam. Soft, calcareous shale is at a depth of 12 inches.

Permeability of the Blazon soil is moderately slow. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 10 to 20 inches.

The Patent soil is very deep and well drained. It formed on uplands and in alluvium on alluvial fans. In a typical profile this soil is light brownish gray clay loam to a depth of 60 inches or more.

Permeability of the Patent soil is moderate. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 60 inches or more.

These soils are used for range. Native vegetation on the Blazon soil is bluebunch wheatgrass, Indian ricegrass, and big sagebrush. Native vegetation on the Patent soil is bluebunch wheatgrass, western wheatgrass, and big sagebrush. Dryland capability subclass VIe.

4—Blazon-Rock outcrop association. This association of shallow and well drained soils and Rock outcrop is on uplands. Slopes range from 30 to 50 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 75 percent Blazon clay loam, 30 to 50 percent slopes; 15 percent Rock outcrop; and 10 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soil.

Included with this association in mapping are areas of Patent, Diamondville, Delphill, and Cotha soils.

In a typical profile of the Blazon soil the surface layer is light gray clay loam. Soft, calcareous shale is at a depth of 12 inches.

Permeability is slow. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 10 to 20 inches.

Rock outcrops are steep escarpments of exposed sandstone ledges and interbedded soft, calcareous shale. Rock outcrop is present at elevations of 5,200 to 7,100 feet.

This association is used for range. The native vegetation is bluebunch wheatgrass, Indian ricegrass, and big sagebrush. Blazon part in dryland capability subclass VIe, Rock outcrop part in dryland capability subclass VIIIs.

5—Cotha-Rock outcrop-Blazon association. This association of moderately steep and steep soils and Rock outcrop is on sandstone ridges in areas of steeply tilted interbedded sandstone and shale bedrock in the uplands. Elevation ranges from 5,200 to 5,700 feet. Slopes range from 15 to 30 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 30 percent Cotha sandy loam, 15 to 30 percent slopes; 30 percent Rock outcrop; 20 percent Blazon clay loam, 15 to 30 percent slopes; and 20 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Forelle, Patent, Diamondville, and Delphill soils.

The Cotha soil is moderately deep and well drained. In a typical profile the surface layer is grayish brown fine sandy loam 3 inches thick. The subsoil is brown sandy loam 14 inches thick. The substratum is brown loam. Sandstone is at a depth of 26 inches.

Permeability of the Cotha soil is moderately rapid. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate to severe. The effective rooting depth is 20 to 40 inches.

Rock outcrops are mainly exposed sandstone; some shale is also exposed.

The Blazon soil is shallow and well drained. In a typical profile the surface layer is light gray clay loam. Soft, calcareous shale is at a depth of 12 inches.

Permeability of the Blazon soil is moderate. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe.

This association is used for range. Native vegetation on the Cotha soil is bluebunch wheatgrass, needleandthread, and big sagebrush. Native vegetation on the Blazon soil is bluebunch wheatgrass, Indian ricegrass, and big sagebrush. Cotha and Blazon parts in dryland capability subclass VIe, Rock outcrop part in dryland capability subclass VIIIs.

6—Crownest-Cotha association. The soils in this association are sloping to moderately steep. They are on uplands in the eastern part of the survey area at elevations of 5,200 to 5,700 feet. Slopes range from 6 to 30 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 45 percent Crownest loamy sand, 6 to 30 percent slopes; 20 percent Cotha fine sandy loam, 6 to 30 percent slopes; 15 percent Blazon clay loam, 6 to 30 percent slopes; and 20 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Forelle, Patent, Delphill, and Diamondville soils.

The Crownest soil is shallow and well drained. In a typical profile the surface layer is pale brown loamy sand 3 inches thick. The underlying material is brown sandy loam. Hard, noncalcareous sandstone bedrock is at a depth of about 10 inches.

Permeability of the Crownest soil is moderately rapid. Available water capacity is low. Surface runoff is rapid, and the hazard of erosion is severe. The effective rooting depth is 10 to 20 inches.

The Cotha soil is moderately deep and well drained. In a typical profile the surface layer is grayish brown fine sandy loam 3 inches thick. The subsoil is brown sandy loam 14 inches thick. The substratum is brown loam. Sandstone is at a depth of about 26 inches.

Permeability of the Cotha soil is moderately rapid. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

The Blazon soil is shallow and well drained. In a typical profile the surface layer is light gray clay loam. Soft, calcareous shale is at a depth of 12 inches.

Permeability of the Blazon soil is moderately slow. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 10 to 20 inches.

These soils are used for range. Native vegetation on the Crownest soil is bluebunch wheatgrass, Sandberg bluegrass, and big sagebrush. Native vegetation on the Cotha soil is bluebunch wheatgrass, needleandthread, and big sagebrush. Native vegetation on the Blazon soil is bluebunch wheatgrass, Indian ricegrass, and big sagebrush. Dryland capability subclass VIe.

7—Delphill clay loam, 3 to 10 percent slopes. This soil is moderately deep and well drained. Slopes range from 3 to 10 percent but are mostly more than 6 percent. This Delphill soil formed in shale that is bedded between thin layers of sandstone at elevations of 5,200 to 5,700 feet. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is light brownish gray clay loam 2 inches thick. The underlying material is light yellowish brown to light brownish gray clay loam, loam, and silty clay loam. Dark shale is at a depth of 24 inches.

Included with this soil in mapping are small areas of Patent, Diamondville, and Blazon soils.

Permeability is moderate. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

Most of the acreage of this soil is used for irrigated hay and pasture; the rest is used for range. Native vegetation

is western wheatgrass, blue grama, and big sagebrush. Irrigated capability unit IVe-2; dryland capability subclass VIe.

8—Diamondville sandy clay loam, 3 to 10 percent slopes. This soil is moderately deep and well drained. It is on uplands at elevations of 5,200 to 5,700 feet. Slopes range from 3 to 10 percent but are mostly more than 6 percent. This soil formed in shale that is interbedded with thin layers of sandstone. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is light brownish gray and brown loam 3 inches thick. The subsoil is brown and pale brown clay loam 9 inches thick. The substratum is light gray loam 10 inches thick. Sandstone and shale are at a depth of 22 inches.

Included with this soil in mapping are small areas of Patent, Delphill, and Blazon soils.

Permeability is moderate. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for range. Native vegetation is western wheatgrass, Sandberg bluegrass, and big sagebrush. Irrigated capability unit IVe-2; dryland capability subclass VIe.

9—Diamondville sandy clay loam, 10 to 15 percent slopes. This soil is moderately deep and well drained. It is on uplands at elevations of 5,200 to 5,700 feet. This soil formed in shale that is interbedded with thin layers of sandstone. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is light brownish gray and brown loam 2 inches thick. The subsoil is brown and pale brown clay loam 8 inches thick. The substratum is light gray loam. Sandstone and shale are at a depth of 22 inches.

Permeability is moderate. Available water capacity is moderate. Surface runoff is rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 20 to 40 inches.

Most of the acreage of this soil is used for irrigated pasture. The rest is used for irrigated hay and range. Native vegetation is western wheatgrass, Sandberg bluegrass, and big sagebrush. Irrigated capability unit VIe-2; dryland capability subclass VIe.

10—Diamondville-Forelle association. The soils in this association are undulating to hilly. They are on uplands at elevations of 5,500 to 7,000 feet. The steeper soils are on breaks along draws and drainageways. Slopes range from 3 to 30 percent but are commonly 3 to 10 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 40 percent Diamondville loam, 3 to 10 percent slopes; 25 percent Forelle sandy clay loam, 3 to 10 percent slopes; and 35 percent included soils and Rock outcrop. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Crownest, Delphill, Blazon, Blackhall, Havre, and Elkol soils. Rock outcrop is also present.

The Diamondville soil is moderately deep and well drained. In a typical profile the surface layer is light brownish gray and brown loam 3 inches thick. The subsoil is brown and pale brown clay loam 9 inches thick. The substratum is light gray loam. Soft, calcareous fine grained sandstone or sandy shale is at a depth of 22 inches.

Permeability of the Diamondville soil is moderate. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

The Forelle soil is very deep and well drained. It formed in alluvium. In a typical profile the surface layer is grayish brown sandy clay loam 2 inches thick. The subsoil is brown to dark brown clay loam 24 inches thick. The substratum is light yellowish brown clay loam to a depth of 60 inches or more.

Permeability of the Forelle soil is moderate. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 60 inches or more.

These soils are used for range. Native vegetation is western wheatgrass, bluebunch wheatgrass, and big sagebrush. Dryland capability subclass VIe.

11—Diamondville-Highpoint association. The soils in this association are moderately steep to steep. They are on back slopes of ridges of hard shale in the uplands. Elevation ranges from 5,200 to 5,700 feet. Slopes range from 10 to 40 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 70 percent Diamondville sandy clay loam, 10 to 15 percent slopes; 15 percent Highpoint channery silty clay loam, 10 to 40 percent slopes; and about 15 percent included soils and Rock outcrop. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Patent, Forelle, Delphill, and Blazon soils. Rock outcrop is also present.

The Diamondville soil is moderately deep and well drained. In a typical profile the surface layer is light brownish gray and brown loam 3 inches thick. The subsoil is brown and pale brown clay loam 9 inches thick. The substratum is light gray loam. Shale is at a depth of 22 inches.

Permeability of the Diamondville soil is moderate. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 20 to 40 inches.

The Highpoint soil is very shallow and well drained. In a typical profile the surface layer is grayish brown channery silty clay loam. Hard weathered shale is at a depth of 7 inches.

Permeability of the Highpoint soil is moderate. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is less than 10 inches.

These soils are used for range. Native vegetation on the Diamondville soil is western wheatgrass, bluebunch wheatgrass, and big sagebrush. Native vegetation on the Highpoint soil is western wheatgrass, black sagebrush, and big sagebrush. Diamondville part in dryland capability subclass VIe, Highpoint part in dryland capability subclass VIIe.

12—Duncom-Farlow-Rock outcrop association. This association of moderately steep to very steep soils and exposed limestone is on canyon sides in the mountains. Elevation ranges from 6,000 to 9,500 feet. Slopes range from 10 to over 60 percent. The average annual precipitation is 15 to 20 inches. The mean annual soil temperature is about 44 degrees F, and the mean summer soil temperature is about 58 degrees F. The frost-free season is 60 to 90 days.

This association is about 30 percent Duncom loam, 20 to 60 percent slopes; 25 percent Farlow channery loam, 10 to 50 percent slopes; 25 percent Rock outcrop; and 20 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Sapphire soils and a loamy alluvial soil on the floors of canyons.

The Duncom soil is shallow and well drained. In a typical profile the surface layer is dark grayish brown loam 9 inches thick. The underlying material is pale brown channery loam 7 inches thick. Limestone is at a depth of 16 inches.

Permeability of the Duncom soil is moderate. Available water capacity is low. Surface runoff is rapid to very rapid, and the hazard of erosion is severe. The effective rooting depth is 10 to 20 inches.

The Farlow soil is deep and well drained. In a typical profile the surface layer is dark grayish brown channery loam 9 inches thick. The next layer is brown very channery loam 8 inches thick. The underlying material is very pale brown very channery loam 29 inches thick. Limestone is at a depth of 46 inches.

Permeability of the Farlow soil is moderate. Available water capacity is moderate to high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 40 to 60 inches.

This association is used for range. Native vegetation on the Duncom soil is Sandberg bluegrass and bluebunch wheatgrass. Native vegetation on the Farlow soil is Sandberg bluegrass, bluebunch wheatgrass, Idaho fescue, and big sagebrush. Duncom part in dryland capability subclass VIIe, Farlow part in dryland capability subclass VIe, Rock outcrop part in dryland capability subclass VIIIs.

13—Elkol clay loam. This soil is very deep and well drained or moderately well drained. It is on alluvial fans at elevations of 5,200 to 5,700 feet. Slopes range from 0 to 6 percent but are generally 3 percent or less. This soil formed in strongly alkaline alluvium. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is light gray, strongly alkaline clay loam 3 inches thick. The underlying material is light brownish gray and light gray, strongly alkaline clay loam and clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Patent and Havre soils, Fluvaquents, and Fluvents, saline.

Permeability is slow. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight to moderate. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for range. Native vegetation is greasewood, gardner saltbush, and western wheatgrass. Irrigated capability unit IVs-12; dryland capability subclass VIs.

14—Elkol-Patent association. The soils in this association are gently sloping to nearly level. They are in areas where alluvial material is being deposited on valley fill as fans. Elevation ranges from 5,200 to 5,700 feet. Slopes range from 0 to 6 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 45 percent Elkol clay loam, 0 to 3 percent slopes; 40 percent Patent clay loam, 0 to 6 percent slopes; and 15 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected use of the soils.

Included with this association in mapping are areas of Havre soils, Fluvaquents, and Fluvents, saline.

The Elkol soil is very deep and well drained. In a typical profile the surface layer is light gray, strongly alkaline clay loam 3 inches thick. The underlying material is light brownish gray and light gray, strongly alkaline clay loam and clay to a depth of 60 inches or more.

Permeability of the Elkol soil is slow. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

The Patent soil is very deep and well drained. It is on alluvial fans. In a typical profile the soil is light brownish gray clay loam to a depth of 60 inches or more.

Permeability of the Patent soil is moderate. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight to moderate. The effective rooting depth is 60 inches or more.

These soils are used for range. Native vegetation on the Elkol soil is western wheatgrass, alkali sacaton, greasewood, and gardner saltbush. Native vegetation on the Patent soil is western wheatgrass, bluebunch wheatgrass, and big sagebrush. Elkol part in dryland capability subclass VIs, Patent part in dryland capability subclass VIe.

15—Farlow-Duncom association. The soils in this association are moderately steep to steep. They are on mountain fronts and canyon sides in the mountains (fig. 6). Elevation ranges from 6,000 to 9,000 feet. The average annual precipitation is 15 to 20 inches. The mean annual soil temperature is about 44 degrees F, and the mean summer soil temperature is about 58 degrees F. The frost-free season is 60 to 90 days.

This association is about 60 percent Farlow channery loam, 10 to 40 percent slopes; 20 percent Duncom loam, 10 to 40 percent slopes; and 20 percent included soils and Rock outcrop. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Sapphire soils and Rock outcrop. Also included are narrow areas of soils that are shallow and are associated with red shale.

The Farlow soil is deep and well drained. It is on mountain fronts. In a typical profile the surface layer is dark grayish brown channery loam 9 inches thick. The next layer is brown very channery loam 8 inches thick. The underlying material is very pale brown very channery loam 29 inches thick. Limestone is at a depth of 46 inches.

Permeability of the Farlow soil is moderate. Available water capacity is moderate to high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 40 to 60 inches.

The Duncom soil is shallow and well drained. It is on mountains. In a typical profile the surface layer is dark grayish brown loam 9 inches thick. The underlying material is pale brown channery loam 7 inches thick. Limestone is at a depth of 16 inches.

Permeability of the Duncom soil is moderate. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 10 to 20 inches.

These soils are used for range. Native vegetation on the Farlow soil is Sandberg bluegrass, bluebunch wheatgrass, Idaho fescue, and big sagebrush. Native vegetation on the Duncom soil is Sandberg bluegrass and bluebunch wheatgrass. Farlow part in dryland capability subclass VIe, Duncom part in dryland capability subclass VIIe.

16—Fluvaquents. The soils in this map unit are very deep and poorly drained and very poorly drained. They are mainly on the foothills of mountains, but are also present along major streams. Slopes range from 0 to 6 percent, but are mostly 3 percent or less. Fluvaquents formed in alluvium on flood plains, low terraces, and low-gradient alluvial fans at elevations of 5,200 to 5,700 feet. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

The texture of these soils ranges from fine sandy loam to clay, but loam is most common. Some Fluvaquents are underlain by gravel at a depth of 20 to 40 inches.

Depth to the water table commonly ranges from 0 to 20 inches; in some areas the depth is as much as 3 feet during part of the year. Permeability above the water table is moderate. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most of the acreage of these soils is used for pasture or range; some small areas are used for wildlife habitat. Native vegetation is sedges, rushes, and cattails. Dryland capability subclass VIw.

17—Fluvents, saline. The soils in this map unit are nearly level to gently sloping. Slopes range from 0 to 6 percent but are commonly 2 to 4 percent. These soils are on valley fill at elevations of 5,200 to 5,700 feet in the eastern part of the survey area (fig. 7). The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Fluvents, saline, vary in texture. Their outstanding characteristic is strong salinity. Most of these soils are wet during part of the growing season. The water table is at a depth of 20 to 40 inches.

Included with these soils in mapping are small areas of Havre soils and Patent clay loam, saline.

These soils are used for range. Native vegetation is alkali sacaton and Nuttall alkaligrass. Dryland capability subclass VIs.

19—Forelle sandy clay loam, 0 to 6 percent slopes. This soil is very deep and well drained. It is on alluvial fans. Elevation ranges from 5,200 to 5,700 feet. This soil formed in alluvium derived from shale. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is grayish brown sandy clay loam 2 inches thick. The subsoil is brown and dark brown clay loam 24 inches thick. The substratum is light yellowish brown clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Patent, Diamondville, and Delphill soils.

Permeability is moderate. Available water capacity is high. Surface runoff is slow to medium, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The remaining acreage is used for range. Native vegetation is western wheatgrass, Sandberg bluegrass, and big sagebrush. Irrigated capability unit IIIe-2; dryland capability subclass VIe.

20—Forelle sandy clay loam, 6 to 10 percent slopes. This soil is very deep and well drained. It is on alluvial fans. Elevation ranges from 5,200 to 5,700 feet. This soil formed in alluvium. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is grayish brown sandy clay loam 2 inches thick. The subsoil is brown and dark brown clay loam 20 inches thick. The substratum is light yellowish brown clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Patent, Diamondville, and Delphill soils.

Permeability is moderate. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for range. Native vegetation is western wheatgrass, Sandberg bluegrass, and big sagebrush. Irrigated capability unit IVe-2; dryland capability subclass VIe.

21—Frisco-Handran-Rock outcrop association. The soils in this association are hilly to very steep. They are on mountains in the western part of the survey area. Elevation ranges from 8,000 to over 11,000 feet. The average annual precipitation is 20 to 40 inches. The mean annual soil temperature is about 41 degrees F, and the mean summer soil temperature is about 53 degrees F. The frost-free season is less than 60 days.

This association is about 60 percent Frisco gravelly loam, 10 to 60 percent slopes; 15 percent Handran stony loam, 10 to 60 percent slopes; 10 percent Rock outcrop; and 15 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Silas soils and soils that are similar to the Silas soils but that are poorly drained and very poorly drained.

The Frisco soil is very deep and well drained. In a typical profile 2 inches of needles and twigs overlies a surface layer of pale brown gravelly loam 6 inches thick. The subsoil is yellowish brown very gravelly clay loam 18 inches thick. The substratum is yellowish brown and black very gravelly loam to a depth of 60 inches or more. Cobblestones and boulders are scattered throughout this soil.

Permeability of the Frisco soil is moderate. Available water capacity is moderate to high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 60 inches or more.

The Handran soil is very deep and well drained. In a typical profile the surface layer is brown very stony loam 10 inches thick. The underlying material is light yellowish brown very gravelly coarse sandy loam to a depth of 60 inches or more. Cobblestones and boulders are scattered throughout this soil.

Permeability of the Handran soil is rapid. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 60 inches or more.

Rock outcrop is mainly talus slopes of exposed granite. Some outcrops of quartzite are along the boundary separating granite and limestone.

This association is used for range. Native vegetation on the Frisco soil is lodgepole pine. Native vegetation on the Handran soil is bluebunch wheatgrass, Idaho fescue, and big sagebrush. Frisco and Handran parts in dryland capability subclass VIs, Rock outcrop part in dryland capability subclass VIIIs.

22—Handran-Leavitt association. The soils in this association are on glacial outwash terraces, on alluvial fans, and along mountain fronts. These areas are near the mouths of some of the larger canyons or are in the canyons. Elevation ranges from about 5,500 feet to about 9,000 feet. The average annual precipitation is about 15 inches. The mean annual soil temperature is about 44 degrees F, and the mean summer soil temperature is about 58 degrees F. The frost-free season is 60 to 90 days.

This association is about 50 percent Handran very stony loam, 5 to 40 percent slopes; 30 percent Leavitt loam, 5 to 10 percent slopes; and 20 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Frisco, Silas, Sapphire, Duncom, and Farlow soils.

The Handran soil is very deep and well drained. In a typical profile the surface layer is brown very stony loam 10 inches thick. The underlying material is light yellowish brown very gravelly coarse sandy loam to a depth of 60 inches or more. Cobbles and boulders are scattered throughout this soil.

Permeability of the Handran soil is rapid. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 60 inches or more.

The Leavitt soil is very deep and well drained. It is on mountains and along mountain fronts. In a typical profile the surface layer is dark brown loam 6 inches thick. The subsoil is reddish brown and brown clay loam 16 inches thick. The substratum is white loam to a depth of 60 inches or more. This soil is underlain by gravel and cobbles. Cobbles are scattered throughout the substratum.

Permeability of the Leavitt soil is moderate. Available water capacity is high. Surface runoff is slow to medium, and the hazard of erosion is slight to moderate. The effective rooting depth is 60 inches or more.

These soils are used for range and recreation. Native vegetation on the Handran soil is bluebunch wheatgrass, Idaho fescue, and big sagebrush. Handran part in dryland capability subclass VIs, Leavitt part in dryland capability subclass VIe.

23—Handran-Midelight association. The soils in this association are rolling. They are in the southeastern part of the survey area on dissected uplands and mountain foothills that are underlain by schist. Elevation ranges from 8,000 to 9,000 feet. Slopes range from 6 to 15 percent. The average annual precipitation is 15 to 20 inches. The mean annual soil temperature is about 44 degrees F, and the mean summer soil temperature is about 55 degrees F. The frost-free season is 60 to 90 days.

This association is about 40 percent Handran very channery loam, 6 to 15 percent slopes; 30 percent Midelight very channery loam, 6 to 15 percent slopes; and 30 percent included soils and Rock outcrop. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Irigul, Silas, and Ansel soils. Rock outcrop is also present.

The Handran soil is very deep and well drained. In a typical profile the surface layer is dark grayish brown very channery loam 10 inches thick. The underlying material is grayish brown very channery loam to a depth of 60 inches or more.

Permeability of the Handran soil is rapid. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 60 inches or more.

The Midelight soil is deep, well drained, and calcareous. In a typical profile the surface layer is brown very channery loam 8 inches thick. The underlying material is pale brown very channery loam. Schist is at a depth of 40 inches.

Permeability of the Midelight soil is moderate. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 40 to 60 inches or more.

These soils are used mainly for range. Native vegetation on the Handran and Midelight soils is Idaho fescue, Sandberg bluegrass, big sagebrush, lodgepole pine, and quaking aspen. Dryland capability subclass VIs.

24—Havre clay loam. This soil is very deep and well drained. It is on flood plains in the foothills of mountains at elevations of 5,200 to 5,700 feet. This soil formed in alluvium. Slopes range from 0 to 6 percent but are generally 3 percent or less. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is brown clay loam 6 inches thick. The underlying material is pale brown stratified clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Fluvaquents; Fluvents, saline; and Elkol soils.

Permeability is moderate. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for range. Native vegetation is western wheatgrass and big sagebrush. Irrigated capability unit IIIe-2; dryland capability subclass VIe.

25—Havre-Elkol clay loams, saline. The soils in this map unit are moderately saline and very deep and are subject to seepage. They are on alluvial fans. Elevation ranges from 5,200 to 5,700 feet. These soils formed in alluvium. Slopes range from 0 to 6 percent but are generally 0 to 3 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This map unit is about 40 percent Havre soils, 25 percent Elkol soils, and 35 percent included soils.

Included with these soils in mapping are areas of nonsaline Elkol, Havre, and Patent soils and a soil that has layers that are high in sodium.

In a typical profile of the Havre soil, the surface layer is brown clay loam 6 inches thick. The underlying material is pale brown clay loam and stratified silty clay loam, oam, and clay to a depth of 60 inches or more.

Permeability of the Havre soil is moderate. Available water capacity is high. A water table is present below a depth of 3 feet in spring and summer. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

In a typical profile of the Elkol soil, the surface layer is light gray, strongly alkaline clay loam 3 inches thick. The next layer is light brownish gray clay loam 7 inches thick. The underlying material is light brownish gray, strongly alkaline clay loam and clay to a depth of 60 inches or more.

Permeability of the Elkol soil is slow. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight to moderate. The effective rooting depth is 60 inches or more.

About half of the acreage of these soils is used for irrigated hay and pasture and half is used for range. Native vegetation on the Havre soil is western wheatgrass and big sagebrush. Native vegetation on the Elkol soil is greasewood, gardner saltbush, and western wheatgrass. Irrigated capability unit IVws-10; dryland capability subclass VIw.

26—Havre complex. The soils in this complex are gently sloping. They are in the mountain foothills on flood plains that are in the paths of developing alluvial fans. Elevation ranges from 5,200 to 5,700 feet. Slopes range from 1 to 6 percent; the soils on alluvial fans commonly slope 3 to 6 percent. The average annual precipitation is

about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This complex is about 60 percent Havre clay loam; 10 percent Havre clay loam, seeped; 15 percent Elkol clay loam; and 15 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this complex in mapping are areas of Patent and Sinkson soils and Fluvents, saline.

The Havre clay loam is deep and well drained. It is on flood plains. In a typical profile the surface layer is brown clay loam 6 inches thick. The underlying material is pale brown clay loam stratified with thin lenses of loam, very fine sandy loam, fine sandy loam, and silt loam.

Permeability of the Havre clay loam is moderate. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

The Havre clay loam, seeped, is similar to Havre clay loam, but it has a saline water table at a depth of 20 to 40 inches.

The Elkol soil is very deep and well drained. It is on alluvial fans and in filled valleys. In a typical profile the surface layer is light gray, strongly alkaline clay loam 3 inches thick. The underlying material is light brownish gray, strongly alkaline clay and clay loam to a depth of 60 inches or more.

Permeability of the Elkol soil is slow. Available water capacity is high. Surface runoff is slow to medium, and the hazard of erosion is slight to moderate. The effective rooting depth is 60 inches or more.

These soils are used for range. Native vegetation on Havre clay loam is western wheatgrass and big sagebrush. Native vegetation on Havre clay loam, seeped, is alkali sacaton and western wheatgrass. Native vegetation on the Elkol soil is western wheatgrass, alkali sacaton, greasewood, and gardner saltbush. Dryland capability subclass VIw.

27—Irigul-Rock outcrop complex, 6 to 30 percent slopes. This complex of rolling to hilly soils and exposed schist is on mountain foothills and mountain fronts. Elevation ranges from 8,000 to 9,000 feet. The average annual precipitation is 15 to 20 inches. The mean annual soil temperature is about 44 degrees F, and the mean summer soil temperature is about 55 degrees F. The frost-free season is 60 to 90 days.

This complex is about 55 percent Irigul channery loam, 6 to 30 percent slopes; 25 percent Rock outcrop; and 20 percent included soils and quartzite outcrops. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soil.

Included with this soil in mapping are areas of Midelight, Handran, and Ansel soils. Also included are small areas of quartzite outcrop. Some rock escarpments have slopes of 6 to 60 percent or more.

The Irigul soil is shallow and well drained. In a typical profile the surface layer is grayish brown channery loam 6 inches thick. The underlying material is yellowish brown channery loam 7 inches thick. Schist is at a depth of 13 inches.

Permeability of the Irigul soil is moderate. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 10 to 20 inches.

This complex is used for range. Native vegetation on the Irigul soil is Sandberg bluegrass, Idaho fescue, and big sagebrush. Dryland capability subclass VIe.

28—Lander loam. This soil is very deep and moderately well drained to somewhat poorly drained. It is on flood plains and along drainageways on uplands. Slopes range 0 to 6 percent, but are usually 2 percent or greater. Elevation ranges from 5,200 to 6,000 feet. This soil formed in alluvium. The average annual precipitation is about 13 inches. The mean annual soil temperature is 45 to 47 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is brown loam 14 inches thick. The underlying material is brown loam and stratified very fine sandy loam, fine sandy loam, and clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Havre soils and a soil that is similar to Lander soils but is poorly drained.

Permeability is moderate. Available water capacity is high. A nonsaline water table is at a depth of 20 to 40 inches. This soil is subject to frequent flooding for brief periods in spring. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

This soil is used mainly for range, but irrigated hay and pasture is also an important use. Native vegetation is Kentucky bluegrass, northern reedgrass, and tufted hairgrass. Irrigated capability unit IIIw-63; dryland capability unit VIw.

29—Lander complex. The soils in this complex are moderately well drained to very poorly drained. They are on flood plains at elevations of 5,200 to 5,700 feet. Slopes range from 0 to 6 percent, but are generally 0 to 3 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This complex is about 75 percent Lander soils and 25 percent included soils.

Included with this complex in mapping are Fluvaquents and Haplaquolls. These are poorly drained and very poorly drained, strongly gleyed or mottled soils in oxbows on flood plains.

The Lander soils are very deep and moderately well drained to somewhat poorly drained. In a typical profile the surface layer is brown loam 14 inches thick. The underlying material is brown loam and stratified very fine sandy loam, fine sandy loam, clay loam, and silt loam to a depth of 60 inches or more.

Permeability is moderate. Available water capacity is high. A water table is at a depth of 20 to 40 inches in spring and summer. The soil is subject to frequent flooding in spring. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

These soils are used for range. Native vegetation on the Lander soils is Sandberg bluegrass, sedges, and willows. Native vegetation on the Fluvaquents and Haplaquolls is sedges, rushes, and cattails. Irrigated capability unit IIIw-62; dryland capability subclass VIw.

30—Leavitt loam. This soil is very deep and well drained. It is on mountain outwash plains. Elevation ranges from 6,000 to 7,000 feet. This soil formed in alluvium. Slopes range from 1 to 6 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 45 degrees F. The frost-free season is 90 to 120 days.

The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

In a typical profile the surface layer is dark brown loam 6 inches thick. The subsoil is reddish brown and brown clay loam 16 inches thick. The substratum is white loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Patent and Handran soils.

Permeability is moderate. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is slight to moderate. The effective rooting depth is 60 inches or more.

This soil is used for range. Native vegetation is bluebunch wheatgrass, Idaho fescue, and threetip sagebrush. Dryland capability subclass VIe.

31—Leavitt-Rock outcrop association. This association of moderately steep to steep soils and Rock outcrop is on escarpments below mountain outwash terraces. Elevation ranges from 6,000 to 7,000 feet. Slopes range from 10 to 60 percent. The average annual precipitation is 13 inches. The mean annual soil temperature is about 45 degrees F. The frost-free season is 90 to 120 days.

This association is about 60 percent Leavitt loam, 10 to 15 percent slopes; 30 percent Rock outcrop; and 10 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Blackhall, Carmody, Thermopolis, and Sinkson soils.

The Leavitt soil is very deep and well drained. It is generally on the upper parts of side slopes above Rock outcrop. In a typical profile the surface layer is dark brown loam 6 inches thick. The subsoil is reddish brown and brown clay loam 16 inches thick. The substratum is white loam to a depth of 60 inches or more.

Permeability is moderate. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 60 inches or more.

Rock outcrop is exposed siltstone, shale, and soft sandstone. It is on the lower parts of escarpments.

This association is used for range. Native vegetation on the Leavitt soil is bluebunch wheatgrass, Idaho fescue, and threetip sagebrush. Leavitt part in dryland capability subclass VIs, Rock outcrop part in dryland capability subclass VIIIs.

32—Lupinto clay loam, 0 to 6 percent slopes. This soil is very deep and well drained. It is on loamy gravel terraces at elevations of 5,200 to 5,600 feet. Slopes range from 0 to 6 percent but are generally 1 to 4 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is 45 to 47 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is grayish brown clay loam 4 inches thick. The subsoil is dark yellowish brown and brown clay loam 9 inches thick. The substratum is very pale brown, calcareous very gravelly loam to a depth of 60 inches or more.

Permeability is moderate above the gravel and rapid in the gravelly layer. Available water capacity is moderate. Surface runoff is slow to medium, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for urban works and structures, homesites, and range. Native vegetation is western wheatgrass, blue grama, and big sagebrush. Irrigated capability unit IIIe-2; dryland capability subclass VIe.

33—Lupinto clay loam, 6 to 10 percent slopes. This soil is very deep and well drained. It is on loamy gravel terraces at elevations of 5,200 to 5,600 feet. This soil formed in alluvium. The average annual precipitation is about 13 inches. The mean annual soil temperature is 45 to 47 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is grayish brown clay loam 4 inches thick. The subsoil is dark yellowish brown and brown clay loam 7 inches thick. The substratum is pale brown, calcareous very gravelly loam to a depth of 60 inches or more.

Permeability is moderate above the gravel and rapid in the gravelly layer. Available water capacity is moderate. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for urban works and structures and for range. Native vegetation is western wheatgrass, blue grama, and big sagebrush. Irrigated capability unit IVe-2; dryland capability subclass VIe.

34—Lupinto clay loam, 0 to 15 percent slopes. This soil is very deep and well drained. It is on loamy gravel terraces along mountain fronts in the central part of the survey area. Elevation ranges from 5,200 to 5,700 feet. This soil formed in alluvium. Slopes range from 0 to 15 percent but, except on terrace breaks, are generally 0 to 3

percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soil.

In a typical profile the surface layer is grayish brown clay loam 4 inches thick. The subsoil is dark yellowish brown and brown clay loam 9 inches thick. The substratum is very pale brown very gravelly loam to a depth of 60 inches or more.

Permeability is moderate above the gravel and rapid in the gravelly layer. Available water capacity is moderate. Surface runoff is slow to medium, and the hazard of erosion is slight to moderate. The effective rooting depth is 60 inches or more.

This soil is used for range. Native vegetation is western wheatgrass, Sandberg bluegrass, and needleandthread. Dryland capability subclass VIe.

35—Lupinto clay loam, saline. This soil is very deep and saline and is subject to seepage. It formed in loamy gravel alluvium at elevations of 5,200 to 5,600 feet. Slopes range from 0 to 6 percent but are generally 0 to 3 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is 45 to 47 degrees F. The frost-free season is 90 to 120 days.

In a typical profile the surface layer is grayish brown clay loam 5 inches thick. The subsoil is dark yellowish brown and brown clay loam 10 inches thick. The substratum is pale brown, calcareous gravelly loam to a depth of 60 inches or more. Iron stains are sometimes present below a depth of 20 inches.

Included with this soil in mapping are small areas of Lupinto clay loam and Fluvents, saline.

Permeability is moderate above the gravel and rapid in the gravelly layer. Available water capacity is low. A saline water table is at a depth of 20 to 40 inches in the growing season. Surface runoff is slow to medium, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for range. Native vegetation is alkali sacaton, Nuttall alkaligrass, and western wheatgrass. Irrigated capability unit IIIws-11; dryland capability subclass VIw.

36—Patent clay loam, 0 to 6 percent slopes. This soil is very deep and well drained. It is on alluvial fans, foot slopes, and uplands. Elevation ranges from 5,200 to 6,000 feet. This soil formed in alluvium and in a mixture of alluvium and residuum. Slopes range from 0 to 6 percent but are generally 1 to 4 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is 45 to 47 degrees F. The frost-free season is 90 to 120 days.

In a typical profile this soil is light brownish gray clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Forelle, Delphill, and Diamondville soils.

Permeability is moderate. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for range. The rest is used for irrigated hay and pasture and for urban works and structures. Native vegetation is western wheatgrass, blue grama, and big sagebrush. Irrigated capability unit IIIe-2; dryland capability subclass VIe.

37—Patent clay loam, 6 to 10 percent slopes. This soil is very deep and well drained. It is on alluvial fans, foot slopes, and uplands. Elevation ranges from 5,200 to 6,000 feet. This soil formed in alluvium on alluvial fans and in mixed alluvium and residuum on uplands. The average annual precipitation is 13 inches. The mean annual soil temperature is 45 to 47 degrees F. The frost-free season is 90 to 120 days.

In a typical profile this soil is light brownish gray clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Forelle, Delphill, Diamondville, and Blazon soils.

Permeability is moderately slow. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for range. A small acreage is used for irrigated hay and pasture and for urban works and structures. Native vegetation is western wheatgrass, blue grama, and big sagebrush. Irrigated capability unit IVe-2; dryland capability subclass VIe.

38—Patent clay loam, saline. This soil is very deep and moderately saline and is subject to seepage. It is on alluvial fans. Slopes range from 0 to 6 percent or more but are commonly 0 to 3 percent. This soil formed in alluvium. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

In a typical profile this soil is light brownish gray clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Patent soils and Fluvents, saline.

Permeability is moderate. Available water capacity is high. The water table is at a depth of 2 to 4 feet in summer. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for range. Native vegetation is alkali sacaton, Nuttall alkaligrass, and inland saltgrass. Irrigated capability unit IIIws-10; dryland capability subclass VIw.

39—Patent-Forelle association. This association of rolling to hilly soils is on uplands and alluvial fans. Elevation ranges from 5,200 to 6,500 feet. Slopes range from 6 to 30 percent but are commonly 8 to 15 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 40 percent Patent clay loam, 6 to 30 percent slopes; 35 percent Forelle sandy clay loam, 6 to 10 percent slopes; and 25 percent included soils and Rock outcrop. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Blazon, Diamondville, Delphill, Cotha, Crownest, Highpoint, Elkol, and Havre soils. Rock outcrop is also present.

The Patent soil is very deep and well drained. In a typical profile, this soil is light brownish gray clay loam to a depth of 60 inches or more.

Permeability of the Patent soil is moderate. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 60 inches or more.

The Forelle soil is very deep and well drained. In a typical profile the surface layer is grayish brown sandy clay loam 2 inches thick. The subsoil is brown and dark brown clay loam 24 inches thick. The substratum is light yellowish brown clay loam to a depth of 60 inches or more.

Permeability of the Forelle soil is moderate. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 60 inches or more.

These soils are used for range. Native vegetation is western wheatgrass, bluebunch wheatgrass, and big sagebrush. Dryland capability subclass VIe.

40—Rock outcrop. This miscellaneous area is in the center of the Wind River Mountain Range. Elevation ranges from 9,000 to more than 12,000 feet. Slopes range from 10 percent to vertical walls. The average annual precipitation is 20 to 40 inches. The mean annual soil temperature is about 40 degrees F, and the mean summer soil temperature is about 52 degrees F. The frost-free season is 30 days or less.

These areas are 90 percent outcrops of granite and 10 percent included soils and outcrops of other kinds of bedrock. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with Rock outcrop in mapping are areas of Silas, Handran, and Frisco soils. Exposed limestone and quartzite are also present. Included areas make up about 10 percent of the map unit.

Rock outcrop is used for recreation. Dryland capability subclass VIIIs.

41—Rock outcrop-Handran association. This association is on uplands of granite and interspersed alluvial fans and colluvial side slopes (fig. 8). Elevation ranges from 8,000 to more than 12,000 feet. Slopes range from 3 percent along streams to vertical rock walls, but are commonly steeper than 20 percent. The average annual precipitation is 20 to 40 inches. The mean annual soil temperature is about 41 degrees F, and the mean summer soil temperature is about 53 degrees F. The frost-free season is less than 60 days.

This association is about 40 percent Rock outcrop; 20 percent Handran very stony loam, 10 to 40 percent slopes; 20 percent Frisco gravelly loam, 10 to 40 percent slopes; and 20 percent included soils. The composition of this association is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soil.

Included with this association in mapping are areas of Silas loam, a very poorly drained soil that is similar to Silas soils, and a stony soil that is similar to Silas soils. Also included are small areas of organic soils in old lakebeds.

Rock outcrop is exposed granite bedrock and granitic rubble.

The Handran soil is very deep and well drained. In a typical profile the surface layer is brown very stony loam 10 inches thick. The underlying material is light yellowish brown very gravelly coarse sandy loam to a depth of 60 inches or more. Cobbles and boulders are throughout the underlying material.

Permeability of the Handran soil is rapid. Available water capacity is moderate to high. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 60 inches or more.

The Frisco soil is very deep and well drained. In a typical profile 2 inches of needles and twigs is over a surface layer of pale brown gravelly loam 6 inches thick. The subsoil is yellowish brown very gravelly clay loam 18 inches thick. The substratum is yellowish brown and black very gravelly loam to a depth of 60 inches or more. Cobbles and boulders are throughout the substratum.

Permeability of the Frisco soil is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 60 inches or more.

The principal use of this association is recreation. Some areas are used for range. Native vegetation on the Handran soil is bluebunch wheatgrass, Idaho fescue, and big sagebrush. The native vegetation on the Frisco soil is lodgepole pine. Rock outcrop part in dryland capability subclass VIIIs, Handran and Frisco parts in dryland capability subclass VIs.

42—Rock outcrop-Highpoint association. This association of exposed hard shale bedrock and steep and very steep soils is on escarpments that are associated with ridges. The soils are on foothills and uplands. Elevation ranges from 5,200 to 6,500 feet. Slopes range from 20 to 70 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 60 percent Rock outcrop; 25 percent Highpoint channery silty clay loam, 20 to 50 percent slopes; and 15 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Diamondville, Forelle, and Patent soils.

Rock outcrop is principally hard shale. Thin sandstone ledges are also present.

The Highpoint soil is very shallow and well drained. In a typical profile the surface layer is grayish brown channery silty clay loam 7 inches thick; it is underlain by shale.

Permeability of the Highpoint soil is moderate. Available water capacity is low. Surface runoff is medium to very rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is less than 10 inches.

This association is in areas that are used for range; however, this association is poorly suited to range because of the steep slopes and sparse vegetation. Shale pits are in some areas of this map unit; the shale is used as road surfacing material. Native vegetation on the Highpoint soil is bluebunch wheatgrass, threadleaf sedge, and Sandberg bluegrass. Rock outcrop part in dryland capability subclass VIIIs, Highpoint part in dryland capability subclass VIIe.

43—Sapphire-Duncom association. The soils in this association are moderately steep to steep. They are on mountain fronts at elevations of 6,000 to 9,500 feet. Slopes range from 10 to 60 percent. The average annual precipitation is 15 to 20 inches. The mean annual soil temperature is about 44 degrees F, and the mean summer soil temperature is 58 degrees F. The frost-free season is 60 to 90 days.

This association is about 65 percent Sapphire stony loam, 10 to 60 percent slopes; 20 percent Duncom loam, 20 to 60 percent slopes; and 15 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Silas and Farlow soils. Rock outcrop is also present.

The Sapphire soil is moderately deep and well drained. In a typical profile 4 inches of needles and twigs overlies a surface layer of light brownish gray stony loam 10 inches thick. The subsoil is pale brown sandy clay loam. Sandstone is at a depth of 35 inches.

Permeability of the Sapphire soil is moderate. Available water capacity is moderate. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 20 to 40 inches.

The Duncom soil is shallow and well drained. In a typical profile the surface layer is dark grayish brown loam 9 inches thick. The underlying material is pale brown channery loam 7 inches thick. Limestone is at a depth of 16 inches.

Permeability of the Duncom soil is moderate. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is moderate to severe. The effective rooting depth is 10 to 20 inches.

These soils are used mainly for recreation. Some areas are used for wooded pasture. Timber is harvested in places. Native vegetation on the Sapphire soil is lodgepole pine. Native vegetation on the Duncom soil is Sandberg bluegrass and bluebunch wheatgrass. Dryland capability subclass VIe.

44—Silas loam. This soil is very deep and somewhat poorly drained. It is along streams and drainageways on mountains and mountain foothills. Elevation ranges from 6,000 to 10,000 feet. This soil formed in alluvium from several kinds of rock. Slopes range from 0 to 6 percent, but are generally 3 to 6 percent. The average annual precipitation is 15 to 30 inches. The mean annual soil temperature is about 43 degrees F, and the mean summer soil temperature is about 55 degrees F. The frost-free season is 60 days or less.

The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soil.

In a typical profile the surface layer is very dark gray and very dark grayish brown loam 22 inches thick. The underlying material is brown loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of a poorly drained soil that is similar to Sinkson soils and a soil that has a thick organic surface layer.

Permeability is moderate. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for range or recreation. Native vegetation is Sandberg bluegrass, quaking aspen, and rose bushes. Dryland capability subclass VIw.

45—Sinkson loam, 0 to 6 percent slopes. This soil is very deep and well drained. Slopes range from 0 to 6 percent but are generally 1 to 4 percent. This soil formed in alluvium derived from red beds on uplands at elevations of 5,400 to 6,000 feet. The average annual precipitation is about 13 inches. The mean annual soil temperature is 45 to 47 degrees F. The frost-free season is 90 to 120 days.

In a typical profile this soil is red loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of a soil that has a dark surface layer and is similar to Sinkson soils.

Permeability is moderate. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for homesites and for range. Native vegetation is western wheatgrass, Sandberg bluegrass, blue grama, and big sagebrush. Irrigated capability unit IIIe-2; dryland capability subclass VIe.

46—Sinkson loam, 6 to 10 percent slopes. This soil is very deep and well drained. Slopes range from 6 to 10 percent but are generally 6 to 8 percent. This soil formed in alluvium derived from red beds on uplands at elevations of 5,400 to 6,000 feet. The average annual precipitation is about 13 inches. The mean annual soil temperature

is 45 to 47 degrees F. The frost-free season is 90 to 120 days.

In a typical profile this soil is red loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of a soil that has a dark surface layer and is similar to Sinkson soils.

Permeability is moderate. Available water capacity is high. Surface runoff is medium, and the hazard of erosion is moderate. The effective rooting depth is 60 inches or more.

Most of the acreage of this soil is used for irrigated hay and pasture. The rest is used for homesites and for range. Native vegetation is western wheatgrass, Sandberg bluegrass, blue grama, and big sagebrush. Irrigated capability unit IVe-2; dryland capability subclass VIe.

47—Sinkson-Thermopolis loams, 3 to 15 percent slopes. These undulating to rolling soils are on red beds, mainly along the mountain front at elevations of 5,500 to 7,300 feet. Slopes range from 3 to 15 percent but are generally 10 to 15 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This map unit is about 45 percent Sinkson soils, 40 percent Thermopolis soils, and 15 percent included soils.

Included with this unit in mapping are Ustic Torrifluvents and Aeric Fluvaquents. Rock outcrop is also present.

The Sinkson soil is very deep and well drained. It is on alluvial fans that are below uplands of Thermopolis soils and Rock outcrop. In a typical profile this soil is red loam to a depth of 60 inches or more.

Permeability of the Sinkson soil is moderate. Available water capacity is high. Surface runoff is rapid, and the hazard of erosion is severe. The effective rooting depth is 60 inches or more.

The Thermopolis soil is shallow and well drained. It formed in residuum from red siltstone and sandy siltstone. In a typical profile this soil is reddish brown loam 15 inches thick; it is underlain by reddish brown siltstone.

Permeability of the Thermopolis soil is moderate. Available water capacity is low. Surface runoff is rapid, and the hazard of erosion is severe. The effective rooting depth is 10 to 20 inches.

About half of the acreage of these soils is used for irrigated hay and pasture and about half for range. Native vegetation is western wheatgrass, Sandberg bluegrass, and big sagebrush. Some scattered juniper is on the Thermopolis part. Irrigated capability unit VIe-14; dryland capability subclass VIe.

48—Sinkson-Thermopolis association. The soils in this association are rolling. They are commonly on the lower part of back slopes above alluvial fans and terraces. They are also on mountain fronts and ridges at elevations of 5,500 to 7,300 feet. Slopes range from 10 to 30 percent. The average annual precipitation is about 13 inches. The mean soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 70 percent Sinkson loam, 6 to 30 percent slopes; 15 percent Thermopolis loam, 10 to 30 percent slopes; and 15 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Ustic Torrifluvents and Aeric Fluvaquents. Rock outcrop is also present.

The Sinkson soil is very deep and well drained. It is on alluvial fans and uplands. In a typical profile this soil is red loam to a depth of 60 inches or more.

Permeability of the Sinkson soil is moderate. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is severe.

The Thermopolis soil is shallow and well drained. It is on uplands. In a typical profile this soil is reddish brown loam; it is underlain by reddish brown siltstone at a depth of 15 inches.

Permeability of the Thermopolis soil is moderate. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is severe. The effective rooting depth is 10 to 20 inches.

These soils are used mainly for range. Native vegetation on the Sinkson soil is western wheatgrass, Sandberg bluegrass, needleandthread, and big sagebrush. Native vegetation on the Thermopolis soil is Sandberg bluegrass, western wheatgrass, big sagebrush, and juniper. Sinkson part in dryland capability subclass VIe, Thermopolis part in dryland capability subclass VIIe.

49—Thermopolis-Sinkson association. The soils in this association are hilly. They are on dissected hogbacks of red siltstone. Elevation ranges from 5,500 to 7,300 feet. Slopes range from 10 to 30 percent; some rock escarpments have vertical walls. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This association is about 50 percent Thermopolis loam, 10 to 30 percent slopes; 35 percent Sinkson loam, 10 to 20 percent slopes; and 15 percent included soils. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Included with this association in mapping are areas of Ustic Torrifluvents, Aeric Fluvaquents, and a sandy soil that is similar to Sinkson soils. Rock outcrop is also present.

The Thermopolis soil is shallow and well drained. It is on uplands and mountain foothills. In a typical profile this soil is reddish brown loam 15 inches thick; it is underlain by reddish brown siltstone.

Permeability of the Thermopolis soil is moderate. Available water capacity is low. Surface runoff is medium to rapid, and the hazard of erosion is severe. The effective rooting depth is 10 to 20 inches.

The Sinkson soil is very deep and well drained. It is on alluvial fans and uplands. In a typical profile this soil is red loam to a depth of 60 inches or more.

Permeability of the Sinkson soil is moderate. Available water capacity is high. Surface runoff is medium to rapid, and the hazard of erosion is severe. The effective rooting depth is 60 inches or more.

These soils are used mainly for range. Native vegetation on the Thermopolis soil is Sandberg bluegrass, western wheatgrass, big sagebrush, and juniper. Native vegetation on the Sinkson soil is western wheatgrass, Sandberg bluegrass, needleandthread, and big sagebrush. Thermopolis part in dryland capability subclass VIIe, Sinkson part in dryland capability subclass VIe.

50—Ustic Torrifluvents-Aeric Fluvaquents complex. The soils in this complex are nearly level to gently sloping. They are on flood plains, mainly in the foothills of mountains, at elevations of 5,200 to 5,700 feet. Slopes range from 0 to 6 percent but are generally 3 to 6 percent. The average annual precipitation is about 13 inches. The mean annual soil temperature is about 46 degrees F. The frost-free season is 90 to 120 days.

This complex is about 40 percent Ustic Torrifluvents, 40 percent Aeric Fluvaquents, and 20 percent Fluvaquents and Haplaquolls that are poorly drained and very poorly drained. The composition of this map unit is more variable than that of others in the survey area, but it has been controlled well enough to be interpreted for the expected uses of the soils.

Ustic Torrifluvents are very deep and somewhat poorly drained. They are on high bottoms or on low terraces.

Aeric Fluvaquents are moderately well drained to somewhat poorly drained. They are on flood plains.

Permeability is moderate to moderately slow. Available water capacity is high. Surface runoff is slow, and the hazard of erosion is slight. The effective rooting depth is 60 inches or more.

These soils are used mainly for range but some areas are used for irrigated pasture. Native vegetation on Ustic Torrifluvents is basin wildrye, green needlegrass, slender wheatgrass, western wheatgrass, and cottonwood. Native vegetation on Aeric Fluvaquents is basin wildrye, dogwood, slender wheatgrass, and willow. Irrigated capability unit IIIw-63; dryland capability subclass VIw.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, rangeland, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Hay and pasture

The major management concerns in the use of the soils for hay and pasture are described in this section. In addition, the pasture plants best suited to the soil, including some not commonly grown in the survey area, are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

The information in this soil survey can be used to help make decisions that affect the future of agricultural land use. The potentials, hazards, and limitations for all types of land use must be evaluated to determine the best use for a particular soil.

About 59,500 acres of the survey area is used for irrigated hay and pasture (fig. 9). The soils in the survey area have poor potential for increased production of forage because irrigation water is not always available to the scattered areas of suitable soil. The short growing season and the cool summers limit the area that can be converted to production of more valuable crops. Forage production can be increased by using the latest production techniques and by improving the management of irrigation water. This soil survey can aid greatly in applying these techniques.

Acreage in hay and pasture is decreasing as more and more land is used for urban development. Many irrigable fields have been subdivided into tracts for homesites with small pastures.

Management of irrigated soils

The object of irrigation is to maintain adequate soil moisture for normal plant growth. A particular soil can provide only a limited amount of water to plants. Among the limiting factors are the drainage characteristics of the soil and the characteristics of the plant roots.

In the spring, natural moisture is generally adequate for germinating hay or pasture plants. The supply of water for irrigation is not always adequate because some irrigators depend on direct flow for their water supply. In these areas irrigation starts with spring runoff, usually in late March or early April. Irrigation is started somewhat later where irrigators have water storage reservoirs.

The major consideration in the management of irrigated soils is the maintenance of soil structure and fertility, but the control of erosion is also important. Maintenance of soil structure is necessary for good soil tilth, desirable water intake, and adequate soil aeration. The soils should not be tilled when the moisture content is high. Organic matter promotes good soil structure. Legumes, grass, and legume-grass mixtures and barnyard manure plowed under help to maintain desirable organic-matter content. The burning of residue destroys organic matter and encourages loss of fertility, poor tilth, and erosion.

If soil is managed well, fertility is maintained at a high level. Grass needs nitrogen. In most places alfalfa needs phosphorus. The supplies of potassium and minor elements in the soils are adequate.

A favorable soil for irrigated hay and pasture has texture of sandy loam to clay loam, good structure, and adequate depth. It also has moderate to high available water capacity and moderate water intake rate. It is free of excessive salts and alkali and has a water table that is not too high.

The limitations of some of the soils in the survey area are discussed in the following paragraphs.

Excessive alkalinity—This condition results from an excessive amount of exchangeable sodium in the soil (*6*). It causes deterioration of the structure and accompanying low water intake rate, poor tilth, and poor aeration.

Where the substratum allows adequate drainage, gypsum can be applied and the soil reclaimed by leaching. Where drainage through the substratum is restricted, alkali-tolerant crops should be grown.

Salinity—Salinity is caused by an excessive amount of soluble salts and normally occurs where the water table is high (*6*). The salts interfere with plant growth by making it more difficult for the plants to absorb water. Saline soils can be reclaimed by draining and leaching if the substratum permits adequate drainage. If drainage is not feasible, salt-tolerant crops should be grown.

Soil drainage—A high water table in the survey area is associated with varying degrees of salinity and is generally detrimental. This condition is caused by excess irrigation and by water seeping from ditches and from soils at higher elevations. If the soil cannot be reclaimed by drainage, salt- and water-tolerant crops should be grown.

Soil depth—More than 40 inches of soil is desirable for irrigated crops. Soils less than 40 inches deep require more frequent irrigation, have less room for root development, and are less productive.

Slope—The most suitable slope for irrigation is nearly level. Soils that slope more than 3 percent are restricted to close-growing crops because furrows create a hazard of erosion on such soils. Grass-legume mixtures on slopes of more than 3 percent should include a sod-forming grass. Slopes of more than 15 percent are not suitable for surface irrigation.

Guides that are helpful in planning irrigation systems have been prepared by the Soil Conservation Service and cooperating agencies. This information is available at the local office of the Soil Conservation Service. Latest information and suggestions for growing special crops can be obtained from the local offices of the Soil Conservation Service and the Extension Service. Soil testing and fertilizer recommendations are available at the Riverton soils laboratory of the University of Wyoming Agricultural Experiment Station.

Capability classification

Capability classification shows, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations

designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

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. (None in the survey area.)

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices. (None in the survey area.)

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 landforms 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 too cold or too 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, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 3. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability subclass or the capability unit is identified in the description of each soil mapping unit in the section "Soil maps for detailed planning." Capability units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

Capability units in classes I to VI, irrigated, are generally identified by numbers assigned as part of a state-wide system. Because the soils in the survey area are not representative of all the units in the system used in Wyoming, the capability units in this survey are not numbered consecutively.

Irrigated soils

Capability units for irrigated soils in the survey area are described in the following paragraphs.

Capability unit IIIe-2, irrigated

This capability unit consists of nearly level to gently sloping, deep, well drained soils that have a surface layer of clay loam, sandy clay loam, or loam. They are slightly susceptible to water erosion. Permeability is moderate to moderately slow. Available water capacity is 9 to 12 inches. The frost-free season is 90 to 120 days.

The soils in this unit are easily cultivated. They are used mainly for irrigated hay and pasture. Small grain is planted to help to control erosion during reestablishment of hay or pasture.

The soils in this unit are irrigated by flooding. Some leveling is generally necessary. Application of water should be controlled to avoid leaching and erosion. Field drainage ditches should be lined with an artificial material or planted to a nonerodible grass, or pipe should be installed.

Capability unit IIIw-63, irrigated

This capability unit consists of nearly level to gently sloping, deep, moderately well drained to somewhat poorly drained loams. They are slightly susceptible to water erosion. The water table is nonsaline and is at a depth of 2 to 4 feet. Permeability is moderate above the water table. The frost-free season is 90 to 120 days.

These soils are difficult to cultivate because they are wet. They sometimes contain moisture in excess of plant needs. These soils are used mainly for irrigated pasture. Some areas are used for irrigated hay.

The soils in this unit are irrigated by controlled flooding. Irrigation is controlled to avoid raising the high water table. Artificial drainage is practical in places.

Capability unit IIIws-10, irrigated

This capability unit consists of nearly level to gently sloping, deep soils. A fluctuating saline water table is in the root zone at a depth of 2 to 4 feet during the growing season. Soluble salts accumulate in the surface layer, and some areas have patches of salt crust on the surface.

Permeability is moderately rapid or moderately slow above the water table. The frost-free season is 90 to 120 days.

These soils are difficult to cultivate because they are wet. They sometimes contain moisture in excess of plant needs. These soils are used mainly for irrigated pasture. Some areas are used for irrigated hay.

The soils in this unit are irrigated by flooding. Irrigation should be controlled to avoid raising the high water table. Artificial drainage is practical in places.

Capability unit IIIws-11, irrigated

Lupinto clay loam, saline, is the only soil in this capability unit. This nearly level to gently sloping, deep soil has a gravelly or very gravelly substratum. A fluctuating saline water table is in the root zone at a depth of 2 to 4 feet during the growing season. Soluble salts accumulate in the surface layer, and patches of salt crust are on the surface in places. Permeability is moderate to moderately rapid above the water table. The frost-free season is 90 to 120 days.

This soil is difficult to cultivate because it is wet. It sometimes contains water in excess of plant needs. This soil is used mainly for irrigated pasture. Some areas are used for irrigated hay.

The soil in this unit is irrigated by flooding. Irrigation should be controlled to avoid raising the high water table. Artificial drainage is practical in places.

Capability unit IVe-2, irrigated

This capability unit consists of gently sloping to sloping, well drained, very deep to moderately deep soils that have a surface layer of clay loam, sandy clay loam, or loam. The moderately deep soils are commonly underlain by clay shale, but some of the soils are underlain by sandstone. The hazard of erosion is moderate to severe. Permeability is moderate to moderately slow. Available water capacity is 3 to 12 inches. The frost-free season is 90 to 120 days.

The soils in this unit are easily cultivated. They are used mainly for irrigated hay and pasture. Small grain is planted to help to control erosion during reestablishment of hay or pasture.

The soils in this unit are irrigated by flooding of contour ditches. Application of water should be controlled to avoid erosion and leaching and, in soils that are underlain by bedrock, to avoid establishing a high water table or causing seepage in lower-lying areas. If field ditches are on an erodible grade, they should be lined, or pipe should be installed.

Capability unit IVs-12, irrigated

Elkol clay loam is the only soil in this capability unit. This soil is nearly level to gently sloping, well drained, very deep, and strongly alkaline. The hazard of water erosion is slight to moderate. Water is absorbed and released slowly. Permeability is slow. Available water capacity is 8 to 12 inches. The frost-free season is 90 to 120 days.

This soil is difficult to cultivate because of the poor tilth, which is caused by alkali. The soil is used mainly for irrigated pasture.

Some areas of this soil can be reclaimed by the addition of gypsum, sulphur, or sulphuric acid and leaching. The irrigation management practices that are recommended for capability unit IIIe-2, irrigated, can be applied to this unit after reclamation.

Capability unit IVws-10, irrigated

Havre-Elkol clay loams, saline, is the only map unit in this capability unit. The soils in this capability unit are nearly level to gently sloping and very deep. They have a saline water table at a depth of 2 to 4 feet. Soluble salts accumulate in the surface layer, and patches of salt crust are on the surface in places. Permeability is moderate to moderately slow above the water table. The frost-free season is 90 to 120 days.

The soils in this capability unit are difficult to cultivate because they are wet. They sometimes contain moisture in excess of plant needs. These soils are used mainly for irrigated pasture.

The soils in this capability unit are irrigated by flooding. Irrigation should be controlled to avoid raising the high water table. If these soils are drained, the Elkol part should be treated with gypsum, sulphur, or sulphuric acid and leached to reduce the level of exchangeable sodium.

Capability unit VIe-2, irrigated

Diamondville sandy clay loam, 10 to 15 percent slopes, is the only soil in this capability unit. This soil is moderately steep, well drained, and moderately deep. The hazard of erosion is moderate to severe. Permeability is moderate. Available water capacity is 6 to 9 inches. The frost-free season is 90 to 120 days.

Cultivation is limited by slope. The soil in this unit is used mainly for irrigated pasture. Some of the acreage is used for irrigated hay.

The soil in this unit is irrigated by flooding from contour ditches. Application of water should be controlled to avoid erosion and leaching. Field ditches should be lined, or pipe should be installed.

Capability unit VIe-14, irrigated

Sinkson-Thermopolis loams, 3 to 15 percent slopes, is the only map unit in this capability unit. These soils are gently sloping to moderately steep, well drained, and very deep and shallow. The hazard of erosion is severe. Permeability is moderate. Available water capacity is 3 to 12 inches. The frost-free season is 90 to 120 days.

Cultivation is limited by slope and depth of the soils. Leveling is not feasible because of the shallow depth. These soils are used mainly for irrigated pasture.

The soils in this unit are irrigated by flooding from contour ditches. Application of water should be controlled to avoid erosion.

Dryland soils

Soils in classes VI to VIII, dryland, are placed in capability subclasses only. A discussion of the management of soils in these subclasses follows.

Capability subclass VIe, dryland

This subclass consists of nearly level to steep, well drained to excessively drained, deep and moderately deep soils that are moderately coarse textured to moderately fine textured. The hazard of water erosion ranges from slight to severe. Permeability is slow to rapid. Available water capacity is 6 to 12 inches. The frost-free season ranges from 60 to 120 days.

The soils in this subclass are used for range and wildlife habitat. These soils are suitable for reseeding, but care should be taken where the hazard of erosion is severe. Gravel pits are in a few areas; they contain pebbles and channery fragments that may hinder the establishment of a seedbed.

Capability subclass VIs, dryland

This subclass consists of nearly level to very steep, well drained, deep and very deep soils. These soils are mainly stony loam, very stony loam, very channery loam, or gravelly loam. Some of the soils are strongly alkaline clay loam, and some are loam underlain by gravel and cobbles. The hazard of erosion is slight to severe. Permeability of the strongly alkaline soils is slow; permeability of the rest of the soils is moderate. Available water capacity is 6 to 12 inches. The frost-free season is 60 to 120 days.

The soils in this subclass are used for range and wildlife habitat. They are suitable for reseeding with adapted plants.

Capability subclass VIw, dryland

This subclass consists of nearly level to gently sloping, wet soils. Some of these soils have a saline water table near the surface during most of the growing season. The frost-free season is 60 to 120 days.

Only water-tolerant plants grow well in soils of this subclass because of the excess moisture. These soils are used for range and wildlife habitat. Drainage is feasible in places.

Capability subclass VIIe, dryland

This subclass consists of moderately steep to very steep and rolling to very steep, well drained, shallow and very shallow soils that are underlain by hard bedrock. The hazard of erosion is moderate to severe. Permeability is moderate. Available water capacity is less than 3 inches. The frost-free season is 60 to 120 days.

The soils in this subclass are used for range and wildlife habitat. They are not suited to reseeding.

Capability subclass VIIIs, dryland

Only Rock outcrop is in this subclass. This miscellaneous area is steep and rocky.

Rock outcrop is suited mainly to wildlife habitat, watershed, or esthetic purposes.

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 4. 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. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 4.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; 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 residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

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 in proper amounts as needed; and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of the soils 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 4 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Rangeland

JIMMY R. BELL, range conservationist, Soil Conservation Service, assisted in preparing this section.

Approximately 55 percent of the survey area is rangeland. Local agricultural income is derived mainly from livestock, primarily cattle; sheep are also grazed. Cow-calf operations are common in the area; however, there are some cow-calf-steer operations. This survey area also supports many deer, elk, and pronghorn antelope and some moose and bighorn sheep. Approximately 57 operating units are in the survey area; the average size of operating units ranges from 10,000 to 12,000 acres.

Most of the ranches supplement range forage with irrigated hay and pasture to balance a year-round operation.

Where climate and topography are about the same, differences in the kind and amount of vegetation that rangeland can produce are related closely to the kind of soil. Effective management is based on the relationships among soils, vegetation, and water.

Table 5 shows, for each kind of soil, the name of the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the expected percentage of each species in the composition of the potential natural plant community. Soils not listed cannot support a natural plant community of predominately grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. The following are explanations of column headings in table 5.

A *range site* is a distinctive kind of rangeland that differs from other kinds of rangeland in its ability to produce a characteristic natural plant community. Soils that produce a similar kind, amount, and proportion of range plants are grouped into range sites. For those areas where the relationship between soils and vegetation has been established, range sites can be interpreted directly from the soil map. Properties that determine the capacity of the soil to supply moisture and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production refers to the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. 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 are such that growing conditions are substantially better than average; in a normal year these conditions are about average for the area; in an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively by wildlife.

Characteristic species of grasses, grasslike plants, forbs, and shrubs that make up most of the potential natural plant community on each soil are listed by common name. Under *Composition*, the expected proportion of each species is presented as the percentage, in air-dry weight, of the total annual production of herbaceous and woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation produced is not used.

Range management requires, in addition to knowledge of the kinds of soil and the potential natural plant community, an evaluation of the present condition of the range vegetation in relation to its potential. 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. Some plant species increase and others decrease when changes occur in the potential plant community because of livestock grazing or some other disturbance. The species of grazing animals, the season of use, and the degree of utilization determine which plant species decrease and which increase. Plants that are not native to the potential plant community are invaders on the site.

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 maximum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Four range condition classes indicate the present condition of the vegetation on a range site in relation to the potential natural vegetation that could grow there. Range is in *excellent* condition if 76 to 100 percent of the vegetation is the same kind as that in the climax stand. Range is in *good* condition if the percentage is 51 to 75, in *fair* condition if the percentage is 26 to 50, and in *poor* condition if the percentage is less than 25.

In part of this survey area, much of the native vegetation has been depleted by continued use, and the dominant native species of grass have given way to less productive species. As a result, the amount of forage produced by the less productive species may be less than one-half of the amount produced by the native species. Big sagebrush has increased in many areas of this survey area.

Some of the soils in this survey area, especially those derived from siltstone, are particularly susceptible to erosion. A good cover of vegetation should be maintained on all soils to prevent erosion. On some range sites, especially Clayey, Loamy, and Sandy sites, restoration of big sagebrush to near its climax or potential composition would be beneficial.

Planned grazing systems—deferred grazing and proper distribution of grazing livestock—are the most effective and least expensive ways to improve rangeland. These

practices work best on rangeland that is in fair, good, or excellent condition. Range seeding and brush management are needed in places to accelerate improvement on range that has deteriorated to fair or poor condition. Plans for better distribution of grazing livestock might include the construction of fences and the development of additional watering facilities.

If sound range management based on information in this soil survey and in rangeland inventories is practiced, the potential is good for increasing the productivity of the range in this survey area.

Descriptions of the range sites

The 16 range sites that occur in the survey area are briefly described in the following pages, and the climax vegetation and principal invaders are named for each site. Production is given for average favorable and unfavorable seasons; these production figures are the normal high and low rather than extremes. Total annual production is expressed in pounds per acre of air-dry material, which includes the current year's growth of leaves, stems, twigs, and fruits of all plants on the site. Not all of this material is usable by livestock.

Subirrigated range site, 15 inch and greater precipitation zone

This range site consists of level or nearly level soils adjacent to streams, lakes, or springs. The soils in this site vary in depth and texture where a nonsaline water table is within reach of the herbaceous forage plants. The water table commonly is at a depth of less than 3 feet.

Nebraska sedge, northern reedgrass, alpine timothy, and slender wheatgrass make up 50 to 60 percent of the potential plant community; tufted hairgrass, Idaho fescue, shrubby cinquefoil, and willow make up 40 to 50 percent. As this site deteriorates, Kentucky bluegrass, Idaho fescue, and shrubby cinquefoil increase. Common timothy and dandelions are the main invaders. The average total annual production is 3,800 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 3,000 pounds in less favorable years to 4,600 pounds in more favorable years.

Loamy range site, 15 inch and greater precipitation zone

The soils in this range site are moderately deep and deep, well drained, nearly level to moderately steep very fine sandy loams, loams, and silt loams. These soils are on uplands in the western part of the survey area.

Slender wheatgrass, mountain brome, Columbian needlegrass, and spike-fescue make up 60 to 70 percent of the potential plant community; Idaho fescue, western wheatgrass, needleandthread, prairie junegrass, forbs, and big sagebrush make up 30 to 40 percent. As this site deteriorates, Idaho fescue, western wheatgrass, forbs, and big sagebrush increase. Cheatgrass is the main invader. The average total annual production is 1,350 pounds per acre of air-dry vegetation when this site is in excellent condition; but production varies from 1,100 pounds in less favorable years to 1,600 pounds in more favorable years.

Shallow loamy range site, 15 inch and greater precipitation zone

The soils on this range site are steep very fine sandy loam to light sandy clay loam, light silty clay, and clay loam. These soils are commonly on uplands. These soils developed over all types of bedrock except igneous. Depth to bedrock ranges from 10 to 20 inches.

Slender wheatgrass, mountain brome, Columbia needlegrass, spike-fescue, and Idaho fescue make up 50 to 60 percent of the potential plant community; western wheatgrass, prairie junegrass, one-spike oatgrass, forbs, big sagebrush, and black sagebrush make up 40 to 50 percent. As this site deteriorates, Sandberg bluegrass, chickweed, western yarrow, other forbs, and big sagebrush increase. Cheatgrass is the most common invader. The average total annual production is 850 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 500 pounds in less favorable years to 1,000 pounds in more favorable years.

Coarse upland range site, 15 inch and greater precipitation zone

This range site consists of bouldery and cobbly soils. These soils are commonly on alluvial fans. The upper 20 inches of the soils is at least 40 percent coarse fragments. These fragments are greater than 3 inches in diameter. Available water capacity is low; therefore, plant density is somewhat reduced.

Idaho fescue, bluebunch wheatgrass, black sagebrush, Columbia needlegrass, and mountain brome make up 60 to 70 percent of the potential plant community; western wheatgrass, prairie junegrass, one-spike oatgrass, forbs, and big sagebrush make up 30 to 40 percent. As this site deteriorates, big sagebrush and forbs increase. Cheatgrass is the most common invader. The average total annual production is 950 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 600 pounds in less favorable years to 1,100 pounds in more favorable years.

Igneous range site, 15 inch and greater precipitation zone

This range site generally consists of steep soils that are derived from schist bedrock and are generally less than 15 inches deep. Small pockets of deep soils are also in this site. These soils are commonly at high elevations on mountains.

Conifers are scattered on this site. Bluebunch wheatgrass, Canby bluegrass, mountain muhly, Idaho fescue, and forbs make up 50 to 60 percent of the potential plant community. Rhizomatous wheatgrasses such as western wheatgrass and thickspike wheatgrass, prairie junegrass, oatgrass, forbs, black sagebrush, and threetip sagebrush and conifers make up 40 to 50 percent. As the site deteri-

orates, forbs, black sagebrush, and threetip sagebrush increase. Annuals are the main invaders on this site. The average total annual production is 500 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 400 pounds in less favorable years to 700 pounds in more favorable years.

Saline subirrigated range site, 10- to 14-inch precipitation zone

This range site consists of nearly level soils. A strong saline or alkaline water table is within reach of the forage plants during most of the growing season. A salt crust is commonly found on the ridges and mounds during dry periods. Areas of this range site are on bottom lands.

Alkali sacaton and Nuttall alkaligrass normally make up 60 percent or more of the potential plant community; inland saltgrass, alkali bluegrass, and greasewood make up 30 to 40 percent. As this site deteriorates, inland saltgrass increases. Dock, foxtail barley, and annuals are the most common invaders on this site. The average total annual production is 2,400 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 1,600 pounds in less favorable years to 2,800 pounds in more favorable years.

Lowland range site, 10- to 14-inch precipitation zone

The soils in this range site vary in texture of the surface layer, depth to gravel, and depth to bedrock. These soils are on lowlands adjacent to streams and are subject to occasional flooding. A nonsaline or nonalkaline water is commonly at a depth of more than 3 feet. This water table greatly benefits woody plants but only slightly benefits herbaceous plants.

Tall grasses, such as basin wildrye, slender wheatgrass, and green needlegrass, make up about 60 percent of the potential plant community; rhizomatous wheatgrasses, forbs, rubber rabbitbrush, silver buffaloberry, silver sagebrush, and cottonwood make up about 40 percent. Cheatgrass, foxtail barley, and mustard are the main invaders on this site. The average total annual production is 1,200 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 900 pounds in less favorable years to 1,500 pounds in more favorable years.

Sandy range site, 10- to 14-inch precipitation zone

The soils in this range site are deep and moderately deep, well drained, nearly level to moderately steep fine sandy loam and loamy fine sand. The soils are on uplands and alluvial fans.

Bluebunch wheatgrass, western wheatgrass, and Indian ricegrass make up 50 to 60 percent of the potential plant community; needleandthread, threadleaf sedge, big sagebrush, and forbs make up 40 to 50 percent. As this site deteriorates, blue grama, threadleaf sedge, and big sagebrush increase. Cactus, cheatgrass, and stickseed are the more common invaders. The average total annual production is 800 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 500 pounds in less favorable years to 1,100 pounds in more favorable years.

Loamy range site, 10- to 14-inch precipitation zone

The soils in this range site are moderately deep and deep, well drained, nearly level to moderately steep very fine sandy loam, silt loam, light sandy clay loam, light silty clay loam, and light clay loam. These soils are on uplands and alluvial fans.

Bluebunch wheatgrass, green needlegrass, and Indian ricegrass make up 50 to 60 percent of the potential plant community; western wheatgrass, needleandthread, threadleaf sedge, prairie junegrass, and big sagebrush make up 40 to 50 percent. As this site deteriorates, blue grama, threadleaf sedge, western wheatgrass, and big sagebrush increase. The average total annual production is 800 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 500 pounds in less favorable years to more than 1,100 pounds in more favorable years.

Clayey range site, 10- to 14-inch precipitation zone

The soils in this range site are deep and moderately deep, well drained, nearly level to moderately steep silty clay, sandy clay loam, silty clay loam, and clay. These soils are on uplands and alluvial fans.

Bluebunch wheatgrass, Indian ricegrass, and green needlegrass make up 50 to 60 percent of the potential plant community; Sandberg bluegrass, prairie junegrass, threadleaf sedge, western wheatgrass, and big sagebrush make up 40 to 50 percent. As this site deteriorates, western wheatgrass, threadleaf sedge, and big sagebrush become more dominant. Cactus, cheatgrass, and annual forbs are the main invaders on this site. The average total annual production is 900 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 500 pounds in less favorable years to 1,100 pounds in more favorable years.

Shallow sandy range site, 10- to 14-inch precipitation zone

The soils in this range site are well drained and nearly level to steep and have a fine sandy loam or coarser texture. Depth to bedrock ranges from 10 to 20 inches. These soils are on uplands in the eastern part of the survey area.

Bluebunch wheatgrass, Indian ricegrass, and western wheatgrass make up 50 to 60 percent of the potential plant community; needleandthread, prairie junegrass, threadleaf sedge, and big sagebrush make up about 40 to 50 percent. As this site deteriorates, needleandthread, blue grama, and big sagebrush increase. Cactus, cheatgrass, and annual forbs are the main invaders on this site. The average total annual production is 500 pounds per acre of air-dry vegetation when this site is in excellent

condition, but production varies from 350 pounds in less favorable years to 700 pounds in more favorable years.

Shallow loamy range site, 10- to 14-inch precipitation zone

The soils in this range site are well drained, nearly level to steep very fine sandy loam to light sandy clay loam, light silty clay, and clay loam. Depth to bedrock ranges from 10 to 20 inches. These soils are in the eastern part of the survey area.

Bluebunch wheatgrass, Indian ricegrass, and green needlegrass make up 50 to 60 percent of the potential plant community; needleandthread, western wheatgrass, prairie junegrass, and big sagebrush make up 40 to 50 percent. As this site deteriorates, needleandthread, western wheatgrass, and big sagebrush increase. Cactus, cheatgrass, sixweeks fescue, and annual forbs are the main invaders. The average total annual production is 500 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 350 pounds in less favorable years to 700 pounds in more favorable years.

Shallow clayey range site, 10- to 14-inch precipitation zone

The soils in this site are well drained, nearly level to steep silty clay, sandy clay loam, and clay. Depth to clay shale bedrock is 10 to 20 inches.

Bluebunch wheatgrass, Indian ricegrass, and spike-fescue make up 50 to 60 percent or more of the potential plant community; western wheatgrass, prairie junegrass, big sagebrush, and perennial forbs make up 40 to 50 percent. As this site deteriorates, western wheatgrass, blue grama, and big sagebrush increase. Cactus, cheatgrass, and annual forbs are the main invaders on this site. The average total annual production is 500 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 350 pounds in less favorable years to 700 pounds in more favorable years.

Very shallow range site, 10- to 14-inch precipitation zone

This range site consists of Rock outcrop and deep and steep sandy to clayey soils that have bedrock at a depth of 5 to 10 inches. Areas of this site are on uplands.

Bluebunch wheatgrass, western wheatgrass, needleandthread, Indian ricegrass, and antelope bitterbrush make up 60 to 70 percent of the potential plant community; prairie junegrass, black sagebrush, and juniper make up 30 to 40 percent. As this site deteriorates, shrubs and forbs increase. Cheatgrass and annual forbs are the main invaders. The average total annual production is 400 pounds per acre of air-dry vegetation when this site is in excellent condition, but production ranges from 200 pounds in less favorable years to 600 pounds in more favorable years.

Woodland management and productivity

GEORGE K. DERN, biologist, Soil Conservation Service, assisted in preparation of this section.

About 56,400 acres of the survey area is woodland. The major part lies in the Shoshone and Bridger National Forests (fig. 10) and adjacent national resource land. The area includes the Popo Agie Primitive Area. Management of this woodland is the responsibility of the Forest Service and the Bureau of Land Management. The only sawmill using timber from the survey area is at Lander.

Lodgepole pine is the most important tree species in the survey area. Limber pine, subalpine fir, Douglas-fir, and quaking aspen are also present. Cottonwood and willow are along drainageways at lower elevations. Rocky Mountain juniper is scattered throughout the rangeland. Lodgepole pine is the only important lumber-producing species.

Table 6 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: x, w, t, d, c, s, f, and r.

In table 6 the soils are also rated for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of major soil limitations.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if some measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

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

equipment; *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 that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate*, that some trees are 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 or grow if openings are made in the tree canopy. The invading plants compete with native plants or planted seedlings by impeding or preventing their growth. 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* means that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed for the control of undesirable plants.

The *potential productivity* of merchantable or *important 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. Important 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.

Woodland understory vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some types of forest, under proper management, can produce enough understory vegetation to support grazing of livestock or wildlife, or both.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees, the density of the canopy, and the depth and condition of the forest litter. The density of the forest canopy affects the amount of light that understory plants receive during the growing season.

Table 7 shows, for each soil suitable for woodland, the potential for producing understory vegetation. The table also lists the common names of the characteristic vegetation that grows on a specified soil and the percentage composition, by air-dry weight, of each kind of plant. The kind and percentage of understory plants listed in the table are those to be expected where canopy density is most nearly typical of forests that yield the highest production of wood crops.

The total production of understory vegetation is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year the soil moisture is above average during the optimum part of the growing season; in a normal year soil moisture is average; and in an unfavorable year it is below average.

Windbreaks and environmental plantings

Windbreaks are established to protect livestock, buildings, and yards from wind and snow. Windbreaks also furnish habitat for wildlife. Several rows of both broad-leaved and coniferous species provide the most protection.

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. Sites for plantings should be cleared of other vegetation. A hardy stock of suitable species should be planted and cultivated to prevent competition from grass and weeds. The plantings need irrigation until they are established. Continued protection from livestock and fire is necessary.

Additional information about planning windbreaks and screens and the planting and care of trees can be obtained from the local offices of the Soil Conservation Service and Extension Service or from local nurserymen.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities; and table 11, for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, and local roads and streets are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold 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. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more or-

ganic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength,

and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

GEORGE K. DERN, biologist, Soil Conservation Service assisted in preparation of this section.

Most of the survey area is used for recreation—camping, hiking, horseback riding, boating, photography, hunting, and fishing (fig. 11). Recreational facilities are available at seven private recreation developments, four public parks in Lander, one State park, and eight National Forest camp and picnic grounds. The Shoshone National Forest contains a large primitive area. Major water areas used for recreation are Frye Lake, Fiddler Lake, Louis Lake, and Wortham Meadows Reservoir (fig. 12).

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the 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 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for 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 for this use 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 camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as 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 will 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 or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Wildlife habitat

GEORGE K. DERN, biologist, Soil Conservation Service assisted in preparation of this section.

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and

water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

The survey area can be divided into two major divisions for wildlife habitat. In the basin area, pronghorn antelope, deer, and sage grouse are the principal wildlife. In the mountain area, deer, elk, and blue grouse are the major wildlife species.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and 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* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties 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 oats and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties 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 wheatgrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties 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, Indian ricegrass, wheatgrass, and grama.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are aspen, cottonwood, mountain maple, and dogwood.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants 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, or foliage used by wildlife or that provide cover and shade for some species of wildlife. Major soil properties that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and moisture. Examples of shrubs are mountain-mahogany, bitterbrush, snowberry, and big sagebrush.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, cattail, wildrice, saltgrass, and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and beaver ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat 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 kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, red fox, killdeer, and woodchuck.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Rangeland habitat consists of areas of wild herbaceous plants and shrubs. Wildlife attracted to rangeland include antelope, mule deer, sage grouse, meadowlark, and lark bunting.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features, engineering test data, and data obtained from physical and chemical laboratory analyses of soils.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (Unified) (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*1*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested in the survey area, with group index numbers in parentheses, is given in table 15. The estimated classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are deter-

mined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

Engineering test data

To evaluate the soils for engineering purposes samples from 12 of the principal soils of the Lander Area were tested by the Wyoming State Highway Department. The results of these tests were given in table 15.

The engineering classifications in table 15 are based on data obtained by grain-size analysis and by tests to determine liquid and plastic limit. The grain-size analysis was made by the sieve method.

Liquid limit and plastic limit tests measure the effect of water on the consistency of soil material. As the moisture content of a clayey soil increases, the material changes from semisolid to plastic; and as the moisture content further increases, the material changes from plastic to liquid. The plastic limit is the moisture content, expressed as a percentage of the oven-dry weight of the soil, at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which the soil material is in a plastic condition. Some silty and sandy soils are nonplastic; that is, they do not become plastic at any moisture content.

Physical and chemical properties

Table 16 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Salinity is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of the nonirrigated soils. The salinity of individual irrigated fields is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of individual fields can differ greatly from the value given in table 16. Salinity affects the suitability of a soil for crop production, its stability when used as a construction material, and its potential to corrode metal and concrete.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to

avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar porperties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops. (None in this survey area.)

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible, but crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible, and crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible, and crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Table 17 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however,

than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Readers interested in further details about the system should refer to "Soil taxonomy" (*7*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 18, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol.* An example is Aridisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Argid (*Arg*, meaning clay, plus *id*, from Aridisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Haplargids (*Hapl*, meaning simple horizons, plus *argid*, the suborder of Aridisols that have a horizon in which clay has accumulated).

SUBGROUP. Each great group may be divided into three kinds of subgroup: the central (typic) concept of the great group, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Cryoboralfs.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is loamy-skeletal, mixed Typic Cryoborolls.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except

for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*5*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Ansel series

The Ansel series consists of very deep, well drained, moderately steep soils that formed in alluvium derived from schist. These soils are on alluvial fans and foot slopes. The mean annual precipitation is 15 to 20 inches. The mean annual air temperature is 42 degrees F.

Ansel soils are similar to Sapphire soils and are near Handran, Midelight, and Irigul soils. Sapphire soils, unlike Ansel soils, are less than 40 inches deep to paralithic contact. Handran, Midelight, and Irigul soils, unlike Ansel soils, lack a B2t horizon.

Typical pedon of Ansel loam, SE1/4NE1/4 sec. 30, T. 30 N., R. 99 W.:

O1—2 inches to 1 inch; pine needles and twigs. (1 to 2 inches thick)

O2—1 inch to 0; decomposed organic matter. (1 to 2 inches thick)

A2—0 to 5 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; many very fine and few coarse roots; few channers and flagstones; neutral (pH 6.8); abrupt wavy boundary. (2 to 8 inches thick)

B2t—5 to 30 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 5/4) moist and crushed; strong fine and medium blocky structure; hard, firm, slightly sticky and plastic; many very fine and few coarse roots in upper part; continuous moderately thick and discontinuous thick clay films on peds; few channers and flagstones; slightly acid (pH 6.1); gradual wavy boundary. (15 to 30 inches thick)

B3t—30 to 42 inches; brown (7.5YR 5/4) loam, brown (7.5YR 5/4) moist and crushed; many coarse prominent dark gray (5Y 4/1) variegations from weathered schist; weak medium and coarse blocky structure; hard, friable, slightly sticky and slightly plastic; few moderately thick clay films on peds; few channers and flagstones; slightly acid (pH 6.1); diffuse wavy boundary. (6 to 20 inches thick)

C—42 to 60 inches; variegated gray (2.5Y 5/1), brown (7.5YR 5/4), and light yellowish brown (10YR 6/4) very fine sandy loam, dark gray (2.5Y 4/1), dark brown (7.5YR 4/4), and yellowish brown (10YR 5/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few channers and flagstones; medium acid (pH 5.8).

Coarse fragments make up 0 to 35 percent of the profile.

Blackhall series

The Blackhall series consists of shallow, well drained, gently sloping to steep soils that formed in material weathered from soft, calcareous sandstone. Blackhall soils are on hills and ridges. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Blackhall soils are similar to Blazon, Thermopolis, and Carmody soils. The control section of Blazon soils, unlike that of Blackhall soils, is more than 18 percent clay. Thermopolis soils, unlike Blackhall soils, have hues redder than 5YR. Carmody soils, unlike Blackhall soils, are more than 20 inches deep to paralithic contact.

Typical pedon of Blackhall gravelly very fine sandy loam in an area of Blackhall-Carmody association, NE1/4SE1/4 sec. 27, T. 30 N., R. 98 W.:

A1—0 to 5 inches; pale brown (10YR 6/3) gravelly very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; many fine and very fine roots; 20 percent pebbles; strongly alkaline (pH 8.2); abrupt wavy boundary. (3 to 8 inches thick)

C1—5 to 12 inches; very pale brown (10YR 8/3) gravelly very fine sandy loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; 20 percent pebbles; strongly calcareous; moderately alkaline (pH 8.2); gradual wavy boundary.

C2r—12 to 20 inches; strongly calcareous, fine grained sandstone. (5 to 12 inches thick)

Depth to bedrock ranges from 10 to 20 inches. The A1 horizon is 15 to 30 percent rock fragments, less than 1 percent of which are larger than 3 inches in diameter. The fragments are generally hard, rounded pebbles.

Blazon series

The Blazon series consists of shallow, well drained, sloping to steep soils that formed in material weathered from soft shale and soft, clayey sandstone. Blazon soils are on uplands. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Blazon soils are similar to Blackhall and Thermopolis soils and are near Patent, Forelle, Diamondville, and Delphill soils. Blackhall soils, unlike Blazon soils, have less than 18 percent clay in the control section. Thermopolis soils, unlike Blazon soils, have hue of 5YR or redder. Patent, Diamondville, Delphill, and Forelle soils, unlike Blazon soils, are more than 20 inches deep.

Typical pedon of Blazon clay loam in an area of Cotha-Rock outcrop-Blazon association, NW1/4SW1/4 sec. 27, T. 33 N., R. 99 W.:

A1—0 to 12 inches; light gray (2.5Y 7/2) clay loam, grayish brown (2.5Y 5/2) moist; weak fine crumb structure; soft, firm, sticky and plastic; common very fine roots; few pebbles; strongly calcareous; moderately alkaline (pH 8.4); gradual wavy boundary. (8 to 20 inches)

Cr—12 to 20 inches; gray (2.5Y 5/1), soft, calcareous shale.

Depth to bedrock ranges from 8 to 20 inches. Hue ranges from 7.5YR to 2.5Y.

Carmody series

The Carmody series consists of moderately deep, well drained, gently sloping to moderately steep soils that formed in material weathered from calcareous siltstone or fine-grained sandstone. Carmody soils are on uplands. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Carmody soils are near Blackhall soils. Blackhall soils, unlike Carmody soils, have bedrock at a depth of less than 20 inches.

Typical pedon of Carmody very fine sandy loam in an area of Blackhall-Carmody association, SW1/4SW1/4 sec. 2, T. 30 N., R. 96 W.:

A1—0 to 8 inches; light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine and very fine granular structure; soft, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; calcareous; moderately alkaline (pH 8.0); gradual wavy boundary. (4 to 10 inches thick)

C1—8 to 25 inches; light brownish gray (10YR 6/2) very fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium and coarse prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and many medium roots; calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary. (16 to 30 inches thick)

C2r—25 to 40 inches; light brownish gray to white (10YR 6/2 to 8/2), calcareous siltstone containing fine-grained sand.

Depth to bedrock is 20 to 40 inches. This soil is 0 to 15 percent channers or fine gravel and is silt loam, very fine sandy loam, or fine sandy loam throughout. The A horizon has hue of 2.5Y or 10YR. The C horizon has hue of 2.5Y or 10YR.

Cotha series

The Cotha series consists of moderately deep, well drained, gently sloping to moderately steep soils that formed in material weathered from noncalcareous sandstone. Cotha soils are on uplands. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Cotha soils are near Blazon and Crownest soils. Blazon and Crownest soils, unlike Cotha soils, are less than 20 inches deep over bedrock.

Typical pedon of Cotha fine sandy loam in an area of Crownest-Cotha association, SE1/4SW1/4 sec. 10, T. 33 N., R. 100 W.:

A1—0 to 3 inches; grayish brown (10YR 5/2) fine sandy loam, dark brown (10YR 3/3) moist; weak very fine crumb structure; soft, very friable, nonsticky and nonplastic; common very fine roots; mildly alkaline (pH 7.4); abrupt smooth boundary. (2 to 10 inches thick)

B1—3 to 9 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; weak medium prismatic structure; soft, very friable, nonsticky and nonplastic; common very fine roots; mildly alkaline (pH 7.6); clear smooth boundary. (0 to 6 inches thick)

B2t—9 to 17 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and nonplastic; thin discontinuous clay films on peds and some clay bridges; few very fine roots; mildly alkaline (pH 7.8); clear wavy boundary. (6 to 10 inches thick)

B3—17 to 26 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; mildly alkaline (pH 7.8); abrupt wavy boundary. (0 to 10 inches thick)

Cr—26 to 40 inches; noncalcareous sandstone.

Depth to bedrock is 20 to 40 inches. The solum is 15 to 30 inches thick. Sandstone pebbles make up 0 to 15 percent of the profile. The A horizon has hue of 2.5Y or 10YR. It is neutral or mildly alkaline. The B2t horizon has hue of 2.5Y to 7.5YR. It is sandy loam or fine sandy loam. It is neutral or mildly alkaline.

Crownest series

The Crownest series consists of shallow, well drained, gently sloping to steep soils that formed in material weathered from hard, noncalcareous sandstone. Crownest soils are on uplands. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Crownest soils are similar to Highpoint soils and are near Cotha soils. Highpoint soils, unlike Crownest soils, have a paralithic contact. Cotha soils, unlike Crownest soils, are more than 20 inches deep over bedrock.

Typical pedon of Crownest loamy sand in an area of Crownest-Cotha association, NW1/4NW1/4 sec. 14, T. 33 N., R 99 W.:

A1—0 to 3 inches; pale brown (10YR 6/3) loamy sand, brown (10YR 5/3) moist; single grained; loose; many fine roots; 10 percent sandstone fragments; mildly alkaline (pH 7.6); abrupt wavy boundary. (2 to 6 inches thick)

C—3 to 10 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; single grained; loose; many fine roots; 30 percent fine sandstone fragments; mildly alkaline (pH 7.8); abrupt wavy boundary. (5 to 14 inches thick)

IIR—10 to 20 inches; reddish brown (5YR 5/3) hard, noncalcareous sandstone.

Depth to bedrock is 10 to 20 inches. The A horizon has hue of 2.5Y or 10YR. It is loamy sand or sandy loam. It is neutral or mildly alkaline. The C horizon has hue of 2.5Y to 7.5YR. It is neutral or mildly alkaline.

Delphill series

The Delphill series consists of moderately deep, well drained, gently sloping to moderately steep soils that formed in material weathered from shale. Delphill soils are on uplands and pediments. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Delphill soils are similar to Patent soils and are near Diamondville, Patent, Forelle, and Blazon soils. Patent and Forelle soils, unlike Delphill soils, are more than 40 inches deep over bedrock. Diamondville soils, unlike Delphill soils, have an argillic horizon. Blazon soils, unlike Delphill soils, are less than 20 inches deep over bedrock.

Typical pedon of Delphill clay loam in an area of Delphill clay loam, 3 to 10 percent slopes, SW1/4NE1/4 sec. 20, T. 33 N., R. 99 W.:

A1—0 to 2 inches; light brownish gray (2.5Y 6/2) clay loam, very dark grayish brown (2.5Y 3/2) moist; upper one-half inch is vesicular, soft crust, rest has weak fine crumb structure; hard, friable, sticky and plastic; many roots; numerous pores; calcareous; strongly alkaline (pH 8.5); abrupt smooth boundary. (1 to 4 inches thick)

C1—2 to 6 inches; light yellowish brown (2.5Y 6/4) clay loam, olive brown (2.5Y 4/4) moist; weak medium prismatic structure parting to moderate very fine subangular blocky; hard, friable, sticky and plastic; many roots; calcareous; strongly alkaline (pH 8.5); clear wavy boundary. (3 to 6 inches thick)

C2—6 to 12 inches; light yellowish brown (2.5Y 6/3) loam, olive brown (2.5Y 4/3) moist; weak medium prismatic structure; slightly hard, friable, slightly sticky and slightly plastic; few partially weathered shale fragments; calcareous; strongly alkaline (pH 8.5); gradual wavy boundary. (4 to 10 inches thick)

C3—12 to 24 inches; light brownish gray (2.5Y 6/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, sticky and plastic; 15 percent partially weathered and unweathered shale fragments; strongly calcareous; strongly alkaline (pH 8.5); gradual wavy boundary. (10 to 20 inches thick)

C4r—24 to 40 inches; fissile, dark-colored shale.

Depth to bedrock ranges from 20 to 40 inches. Soil contains 0 to 15 percent coarse fragments of shale or sandstone. The underlying bedrock is shale or soft sandstone. The A horizon has hue of 2.5Y to 10YR. The A horizon is noncalcareous in places. The C horizon ranges from loam to silty clay loam. It has hue of 10YR to 5Y.

Diamondville series

The Diamondville series consists of moderately deep, well drained, gently sloping to moderately steep soils that formed in material weathered from siltstone, sandstone, and shale. Diamondville soils are on hills and ridges. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Diamondville soils are similar to Forelle soils and are near Forelle, Patent, Blackhall, and Crownest soils. The Forelle soils, unlike Diamondville soils, do not have bedrock above a depth of 40 inches. Patent soils, unlike Diamondville soils, are more than 40 inches deep to bedrock and do not have an argillic horizon. Blackhall and Crownest soils, unlike Diamondville soils, are less than 20 inches deep to bedrock.

Typical pedon of Diamondville loam in an area of Diamondville-Forelle association, NW1/4SW1/4 sec. 34, T. 30 N., R. 97 W.:

A11—0 to 1 inch; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium platy structure; soft, very friable, nonsticky and slightly plastic; neutral (pH 7.3); abrupt smooth boundary. (1 to 2 inches thick)

A12—1 inch to 3 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak thin platy structure parting to moderate very fine subangular blocky; soft, very friable, nonsticky and slightly plastic; many very fine and fine and common medium roots; mildly alkaline (pH 7.4); abrupt smooth boundary. (1 to 3 inches thick)

B1—3 to 5 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak thin platy structure parting to moderate very fine subangular blocky; slightly hard, friable, sticky and plastic; many very fine and fine and common medium roots; many very fine to coarse pores; mildly alkaline (pH 7.4); abrupt smooth boundary. (0 to 4 inches thick)

B21t—5 to 9 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to strong medium subangular blocky; slightly hard, firm, sticky and plastic; common very fine to coarse roots and pores; common thin discontinuous clay films on peds; 10 percent pebbles; mildly alkaline (pH 7.4); clear wavy boundary. (4 to 6 inches thick)

B22t—9 to 12 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; moderate fine subangular blocky structure; slightly hard, firm, sticky and plastic; common very fine to coarse roots and pores; common thin continuous clay films on peds; 10 percent pebbles; mildly alkaline (pH 7.6); gradual wavy boundary. (2 to 5 inches thick)

C1ca—12 to 22 inches; light gray (2.5Y 7/2) loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, friable, slightly sticky and plastic; common roots as large as 18 inches in diameter; many very fine to coarse pores; 25 percent sandstone pebbles; calcareous; moderately alkaline (pH 8.0); gradual wavy boundary. (8 to 23 inches thick)

C2r—22 to 40 inches; fine-grained sandstone.

Depth to bedrock ranges from 20 tc 40 inches. The A horizon ranges from sandy loam to loam. The B2t horizon has hue of 7.5YR to 10YR.

Duncom series

The Duncom series consists of shallow, well drained, moderately steep to very steep soils that formed in material weathered from limestone and dolomite. Duncom soils are on mountainsides and ridges. The mean annual precipitation is about 15 inches. The mean annual air temperature is about 35 degrees F.

Duncom soils are near Farlow and Sapphire soils. Farlow and Sapphire soils, unlike Duncom soils, are more than 20 inches deep over bedrock.

Typical pedon of Duncom loam in an area of Farlow-Duncom association, SW1/4SW1/4 sec. 4, T. 30 N., R. 99 W.:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; weak fine crumb structure; soft, very friable, nonsticky and nonplastic; mildly alkaline (pH 7.6); abrupt smooth boundary. (4 to 7 inches thick)

C1—5 to 9 inches; dark grayish brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; weak fine crumb structure; soft, very friable, slightly sticky and slightly plastic; strongly calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary. (3 to 6 inches thick)

C2ca—9 to 16 inches; pale brown (10YR 6/3) channery loam, brown (10YR 4/3) moist; massive; soft, very friable, nonsticky and nonplastic; 20 percent limestone channers; strongly calcareous; strongly alkaline (pH 8.5); clear wavy boundary. (3 to 10 inches thick)

R—16 to 20 inches; hard, fractured limestone.

Depth to bedrock ranges from 10 to 20 inches. This soil is as much as 35 percent channers.

Elkol series

The Elkol series consists of deep, well drained or moderately well drained, nearly level to moderately sloping, very strongly alkaline soils that formed in alluvium. Elkol soils are on alluvial fans and terraces. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Elkol soils are near Havre and Patent soils. Havre and Patent soils, unlike Elkol soils, contain less than 15 percent exchangeable sodium.

Typical pedon of Elkol clay loam, NW1/4NE1/4 sec. 1, T. 33 N., R. 99 W.:

A1—0 to 3 inches; light gray (10YR 7/2) clay loam, grayish brown (10YR 5/2) moist; moderate very thin platy structure; slightly hard, friable, sticky and plastic; calcareous; strongly alkaline (pH 8.6); abrupt smooth boundary. (2 to 4 inches thick)

AC—3 to 10 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic structure parting to moderate fine angular blocky; hard, firm, sticky and plastic; calcare-

ous; strongly alkaline (pH 9.0); gradual wavy boundary. (4 to 10 inches thick)
C—10 to 60 inches; light gray (2.5Y 7/2) clay, olive brown (2.5Y 4/3) moist; massive; very hard, very firm, very sticky and very plastic; strongly calcareous; strongly alkaline (pH 9.0).

This soil has hue of 10YR to 5Y. Texture is silty clay loam, clay loam, or clay. Clay content is less than 45 percent.

Farlow series

The Farlow series consists of deep, well drained moderately steep to steep soils that formed in material weathered from limestone and dolomite. Farlow soils are on mountainsides. The mean annual precipitation is about 15 inches. The mean annual air temperature is about 35 degrees F.

Farlow soils are similar to Handran soils and are near Duncom soils. Handran soils, unlike Farlow soils, are noncalcareous. Duncom soils, unlike Farlow soils, are less than 20 inches deep over bedrock.

Typical pedon of Farlow channery loam in an area of Farlow-Duncom association, SW1/4SW1/4 sec. 4, T. 30 N., R. 99 W.:

A1—0 to 9 inches; dark grayish brown (10YR 4/2) channery loam, dark brown (10YR 3/3) moist; weak fine crumb structure; soft, very friable, slightly sticky and slightly plastic; 20 percent channers; calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary. (6 to 12 inches thick)
AC—9 to 17 inches; brown (10YR 5/3) very channery loam, brown (10YR 4/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; 50 percent channers; calcareous; strongly alkaline (pH 8.6); clear wavy boundary. (6 to 12 inches thick)
C1ca—17 to 30 inches; very pale brown (10YR 8/3) very channery loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; 60 percent channers; calcareous; many fine nests, threads, and seams of calcium carbonate; strongly alkaline (pH 8.6); clear wavy boundary. (6 to 15 inches thick)
C2—30 to 46 inches; very pale brown (10YR 7/3) very channery loam, pale brown (10YR 6/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; 80 percent channers; calcareous; strongly alkaline (pH 8.6); gradual wavy boundary. (12 to 24 inches thick)
R—46 to 60 inches; limestone.

Depth to bedrock is 40 to 60 inches. The fine earth material in the control section is loam or clay loam. Limestone channers make up 35 to 95 percent of the control section; calcium carbonate equivalent ranges from 15 to 40 percent. The A horizon has hue of 2.5Y or 10YR. It is moderately alkaline to strongly alkaline. The C horizon has hue of 2.5Y or 10YR. It is moderately alkaline or strongly alkaline.

Forelle series

The Forelle series consists of very deep, well drained gently sloping to hilly soils that formed in alluvium, principally from shale. Forelle soils are on uplands and on alluvial fans and toeslopes. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Forelle soils are similar to Diamondville soils and are near Patent, Diamondville, and Delphill soils. Diamondville soils, unlike Forelle soils, have a paralithic contact between depths of 20 and 40 inches. Patent and Delphill soils, unlike Forelle soils, do not have an argillic horizon.

Typical pedon of Forelle sandy clay loam in an area of Patent-Forelle association, SW1/4SW1/4 sec. 14, T. 32 N., R. 99 W.:

A1—0 to 2 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine roots; mildly alkaline (pH 7.6); abrupt smooth boundary. (1 to 4 inches thick)
B1—2 to 5 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; weak medium and coarse prismatic structure; hard, firm, sticky and plastic; many very fine roots; mildly alkaline (pH 7.4); abrupt smooth boundary. (0 to 5 inches thick)
B21t—5 to 10 inches; dark brown (10YR 4/3) clay loam, dark brown (10YR 4/3) moist and crushed; strong medium prismatic structure parting to strong medium and fine angular blocky; hard, firm, sticky and plastic; many very fine roots; common moderately thick discontinuous clay films on peds; mildly alkaline (pH 7.4); clear smooth boundary.
B22t—10 to 18 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist and crushed; strong medium prismatic structure parting to medium and fine angular blocky; hard, firm, slightly sticky and slightly plastic; few very fine and medium roots; common thin discontinuous films on peds; mildly alkaline (pH 7.4); abrupt wavy boundary. (B2t is 8 to 14 inches thick.)
B3ca—18 to 26 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure; slightly hard, firm, sticky and plastic; few very fine and medium roots; few thin discontinuous clay films on vertical surface of peds; strongly calcareous, carbonate segregations as coatings on peds; moderately alkaline (pH 8.3); gradual wavy boundary. (4 to 12 inches thick)
C—26 to 60 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, firm, sticky and plastic; strongly calcareous; strongly alkaline (pH 8.5).

This soil is as much as 15 percent coarse fragments. It has hue of 10YR or 2.5Y. The A horizon is fine sandy loam, sandy clay loam, loam, or clay loam.

Frisco series

The Frisco series consists of very deep, well drained, hilly to very steep soils that formed in alluvium from granite. Frisco soils are on mountains. The mean annual precipitation is 20 to 40 inches. The mean annual air temperature is about 32 degrees F. This is a taxadjunct to the Frisco series.

Frisco soils are near Handran soils. Handran soils, unlike Frisco soils, do not have an argillic horizon.

Typical pedon of Frisco gravelly loam in an area of Frisco-Handran-Rock outcrop association, NE1/4SW1/4 sec. 11, T. 31 N., R. 101 W.:

O1—2 inches to 1 inch; pine needles and twigs. (1 to 3 inches thick)
O2—1 inch to 0; decomposed organic matter. (1/2 to 2 inches thick)
A2—0 to 6 inches; pale brown (10YR 6/3) gravelly loam, brown (10YR 5/3) moist; weak fine crumb structure; slightly hard, friable, slightly sticky and nonplastic; many fine and very fine and many medium roots; 20 percent pebbles, cobbles, and boulders; neutral (pH 6.6); gradual wavy boundary. (4 to 10 inches thick)
B2t—6 to 24 inches; yellowish brown (10YR 5/4) very gravelly clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium angular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many fine and very fine and many medium roots; common thin discontinuous clay films; 50 percent pebbles, cobbles, and boulders; slightly acid (pH 6.2); diffuse wavy boundary. (15 to 25 inches thick)
C—24 to 60 inches; variegated yellowish brown (10YR 5/4) and black (10YR 2/1) very gravelly loam; single grained; loose; 60 percent pebbles, cobbles, and boulders; slightly acid (pH 6.4).

Coarse fragments make up 35 percent or more of this soil. Pebbles are predominantly fine.

Handran series

The Handran series consists of very deep, well drained, rolling to steep soils that formed in materials weathered from granite. Handran soils are on uplands and alluvial fans and valley fill in the mountains. The mean annual precipitation is about 18 inches. The mean annual air temperature is about 32 degrees F.

Handran soils are near Frisco and Leavitt soils. Frisco and Leavitt soils, unlike Handran soils, have an argillic horizon.

Typical pedon of Handran very stony loam in an area of Handran-Leavitt association, SW1/4NW1/4 sec. 24, T. 32 N., R. 101 W.:

A1—0 to 10 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 3/3) moist; moderate very fine crumb structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and very fine roots; 30 percent stones; neutral (pH 7.2); abrupt smooth boundary. (7 to 15 inches thick)

C—10 to 60 inches; light yellowish brown (10YR 6/4) very gravelly coarse sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; few fine and very fine roots; 50 percent pebbles and 10 percent cobbles; mildly alkaline (pH 7.6).

Fifty to eighty percent of the surface is covered with boulders. Handran soils that are mapped with Frisco and Leavitt soils contain rounded, coarse fragments of granite. The Handran soils that are mapped with Irigul and Midelight soils contain coarse angular fragments of schist.

Havre series

The Havre series consists of very deep, well drained nearly level to gently sloping soils that formed in alluvium. Havre soils are on flood plains, low terraces, and alluvial fans. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Havre soils are near Elkol soils. Elkol soils, unlike Havre soils, contain more than 15 percent exchangeable sodium.

Typical pedon of Havre clay loam, NE1/4SW1/4 sec. 29, T. 34 N., R. 100 W.:

Ap—0 to 6 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; weak medium and fine blocky structure; very hard, firm, sticky and plastic; few pebbles; strongly calcareous; mildly alkaline (pH 7.8); abrupt smooth boundary. (4 to 10 inches thick)

C—6 to 60 inches; pale brown (10YR 6/3) clay loam with thin strata of silty clay loam, loam, and clay, brown (10YR 4/3) moist; massive; very hard, firm, sticky and plastic; few pebbles and cobbles; strongly calcareous; moderately alkaline (pH 8.4).

The C horizon has thin strata of clay loam, silty clay loam, loam, clay, very fine sandy loam, and sandy loam; clay loam is dominant. The C horizon has hue of 7.5YR to 10YR.

Highpoint series

The Highpoint series consists of shallow, well drained, steep soils that formed in material weathered from hard shale. Highpoint soils are on uplands. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Highpoint soils are near Blazon and Diamondville soils. Blazon soils, unlike Highpoint soils, have a calcareous control section. Diamondville soils, unlike Highpoint soils, are more than 20 inches deep to bedrock.

Typical pedon of Highpoint channery silty clay loam in an area of Rock outcrop-Highpoint association, NW1/4NW1/4 sec. 10, T. 31 N., R. 99 W.:

A1—0 to 7 inches; grayish brown (2.5Y 5/2) channery silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; slightly hard, firm, sticky and plastic; abundant very fine roots; 20 percent channers; neutral (pH 7.2); gradual irregular boundary. (6 to 10 inches thick)

Cr—7 to 20 inches; grayish brown (2.5Y 5/2) weathered shale, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, firm, sticky and plastic; many fine and very fine roots in the upper part; neutral (pH 7.2).

Depth to bedrock ranges from 6 to 10 inches.

Irigul series

The Irigul series consists of shallow, well drained moderately sloping to steep soils that formed in material weathered from schist. Irigul soils are on uplands. The mean annual precipitation is about 12 inches. The mean annual air temperature is about 44 degrees F.

Irigul soils are near Handran, Midelight, and Ansel soils. Handran, Midelight, and Ansel soils, unlike Irigul soils, are more than 40 inches deep over bedrock.

Typical pedon of Irigul channery loam in an area of Irigul-Rock outcrop complex, 6 to 30 percent slopes, NE1/4SE1/4 sec. 32, T. 30 N., R. 99 W.:

A1—0 to 6 inches; grayish brown (10YR 5/2) channery loam, very dark grayish brown (10YR 3/2) moist; weak very fine crumb structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; 40 percent channers on the surface and in the soil; mildly alkaline (pH 7.4); abrupt wavy boundary. (4 to 12 inches thick)

C—6 to 13 inches; yellowish brown (10YR 5/4) very channery loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; 60 percent channers and 5 percent flagstones; mildly alkaline (pH 7.4); abrupt wavy boundary. (0 to 10 inches thick)

IIR—13 to 20 inches; schist.

Depth to bedrock is 10 to 20 inches. The control section is very channery loam or very channery clay loam. This soil is 35 to 75 percent channers and 5 to 10 percent flagstones. The A horizon has hue of 2.5Y or 10YR. The C horizon has hue of 2.5Y to 7.5YR.

Lander series

The Lander series consists of very deep, moderately well drained to somewhat poorly drained, nearly level to gently sloping soils that formed in calcareous alluvium. Lander soils are on flood plains. The mean annual

precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Lander soils are near Lupinto soils. Lupinto soils are well drained.

Typical pedon of Lander loam, SW1/4SE1/4 sec. 26, T. 32 N., R. 99 W.:

A1—0 to 14 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; strong medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; calcareous; moderately alkaline (pH 8.3); gradual wavy boundary.

C—14 to 60 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 4/4) moist; common fine distinct strong brown (7.5YR 5/6) mottles in lower part; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and many medium roots; calcareous; moderately alkaline (pH 8.4).

The control section is loam with strata of fine sandy loam, silt loam, clay loam, and silty clay loam. This soil is 0 to 35 percent coarse fragments. The A horizon has hue of 2.5Y to 7.5YR. The C horizon has hue of 2.5Y to 7.5YR.

Leavitt series

The Leavitt series consists of very deep, well drained, nearly level to moderately steep soils that formed in alluvium. Leavitt soils are on glacial outwash terraces. The mean annual precipitation is about 12 inches. The mean annual air temperature is about 35 degrees F.

Leavitt soils are near Handran soils. Handran soils, unlike Leavitt soils, do not have an argillic horizon.

Typical pedon of Leavitt loam, NE1/4NE1/4 sec. 1, T. 30 N., R. 99 W.:

A1—0 to 6 inches; dark brown (10YR 3/3) loam, very dark brown (10YR 2/2) moist; weak very fine crumb structure; slightly hard, friable, slightly sticky and slightly plastic; abundant very fine roots; few cobbles and pebbles; neutral (pH 7.0); abrupt smooth boundary. (5 to 12 inches thick)

B1t—6 to 9 inches; reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) moist; weak medium prismatic structure parting to strong fine blocky; hard, firm, sticky and plastic; few fine and very fine roots; many thin clay films on peds; 15 percent cobbles and pebbles; neutral (pH 6.8); abrupt smooth boundary. (0 to 6 inches thick)

B2t—9 to 15 inches; reddish brown (5YR 4/3) clay loam, dark reddish brown (5YR 3/3) moist; weak medium prismatic structure parting to strong fine blocky; hard, very firm, sticky and plastic; few very fine and fine roots; continuous moderately thick clay films on peds; 15 percent cobbles and pebbles; neutral (pH 6.8); abrupt smooth boundary. (6 to 15 inches thick)

B3t—15 to 22 inches; brown (7.5YR 5/4) clay loam, dark brown (7.5YR 4/4) moist; weak medium prismatic structure parting to weak medium blocky; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; common thin clay films on peds; 15 percent cobbles and pebbles; moderately alkaline (pH 8.0); abrupt wavy boundary. (0 to 9 inches thick)

Cca—22 to 60 inches; white (10YR 8/2) loam, light gray (10YR 7/2) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; few pebbles and cobbles; strongly calcareous; strongly alkaline (pH 8.6).

This soil is 15 to 35 percent coarse fragments above a depth of 40 inches. The coarse fragments are pebbles, cobbles, and boulders.

Lupinto series

The Lupinto series consists of very deep, well drained, nearly level to moderately steep soils that formed in alluvium. Lupinto soils are on terraces and alluvial fans. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Lupinto soils are near Forelle soils. Forelle soils, unlike Lupinto soils, have less than 35 percent coarse fragments in the control section.

Typical pedon of Lupinto clay loam in an area of Lupinto clay loam, 0 to 6 percent slopes, SW1/4NE1/4 sec. 19, T. 33 N., R. 99 W.:

A1—0 to 4 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine crumb structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; few subrounded pebbles; mildly alkaline (pH 7.5); abrupt smooth boundary. (2 to 5 inches thick)

B2t—4 to 9 inches; dark yellowish brown (10YR 4/4) clay loam, dark brown (10YR 3/3) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky and plastic; many very fine and fine roots; few angular and rounded pebbles; common thin continuous and thick discontinuous clay films on peds; mildly alkaline (pH 7.8); clear wavy boundary. (4 to 6 inches thick)

B3tca—9 to 13 inches; brown (10YR 5/3) clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky and plastic; few fine roots; common thin discontinuous clay films on vertical surfaces of peds; strongly calcareous; pebbles have lime crust on lower sides; moderately alkaline (pH 8.4); clear wavy boundary. (3 to 6 inches thick)

IICca—13 to 60 inches; very pale brown (10YR 7/3) very gravelly loam, pale brown (10YR 6/3) moist; massive; hard, friable, nonsticky and nonplastic; 60 percent pebbles and few cobbles; strongly calcareous; strongly alkaline (pH 8.6).

The A1 horizon has hue of 10YR to 7.5YR. The B horizon has hue of 7.5YR to 10YR. The C horizon has hue of 7.5YR to 10YR.

Midelight series

The Midelight series consists of deep, well drained, nearly level to sloping soils that formed in alluvium derived from schist. Midelight soils are on alluvial fans and pediments. The mean annual precipitation is about 12 inches. The mean annual air temperature is about 35 degrees F.

Midelight soils are similar to Handran soils and are near Handran and Irigul soils. Handran soils, unlike Midelight soils, are noncalcareous. Irigul soils, unlike Midelight soils, have bedrock at a depth of 10 to 20 inches.

Typical pedon of Midelight very channery loam in an area of Handran-Midelight association, NW1/4SW1/4 sec. 33, T. 30 N., R. 99 W.:

A1—0 to 8 inches; brown (10YR 4/3) very channery loam, dark brown (10YR 3/3) moist; weak very fine crumb structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; 60 percent channers and flagstones; mildly alkaline (pH 7.4); abrupt wavy boundary (6 to 12 inches thick)

C—8 to 40 inches; pale brown (10YR 6/3) very channery loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very fria-

ble, slightly sticky and slightly plastic; 65 percent channers, 5 percent flagstones; calcareous; undersides of coarse fragments are coated with carbonates; moderately alkaline (pH 8.4); clear wavy boundary. (25 to 35 inches thick)
R—40 to 44 inches; schist.

Depth to bedrock is 40 to 60 inches. Depth to calcareous material is 6 to 12 inches. The control section is very channery loam or very channery clay loam. This soil is 50 to 75 percent channers and 0 to 5 percent flagstones. The A horizon has hue of 2.5Y or 10YR. It is mildly alkaline or moderately alkaline. The C horizon has hue of 2.5Y to 7.5YR. It is mildly alkaline to strongly alkaline.

Patent series

The Patent series consists of very deep, well drained, nearly level to steep soils that formed in alluvium and material weathered from soft shale. Patent soils are on alluvial fans and uplands. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Patent soils are similar to Delphill soils and are near Delphill, Diamondville, Forelle, and Blazon soils. Delphill soils, unlike Patent soils, have a paralithic contact at a depth of 20 to 40 inches. Diamondville and Forelle soils, unlike Patent soils, have an argillic horizon. Blazon soils, unlike Patent soils, are less than 20 inches deep over bedrock.

TYypical pedon of Patent clay loam in an area of Patent-Forelle association, NW1/4SW1/4 sec. 1, T. 31 N., R. 97 W.:

A1—0 to 7 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; hard, firm, sticky and plastic; many fine and few very fine roots; strongly calcareous; moderately alkaline (pH 8.2); clear wavy boundary. (4 to 7 inches thick)
C—7 to 60 inches; light brownish gray (2.5Y 6/2) clay loam, dark grayish brown (2.5Y 4/2) moist; massive; hard, firm, sticky and plastic; many fine and few very fine roots in upper 20 inches; strongly calcareous; moderately alkaline (pH 8.3).

This soil is as much as 15 percent coarse fragments. The control section ranges from sandy clay loam to clay loam.

Sapphire series

The Sapphire series consists of moderately deep, well drained, steep to very steep soils that formed in material weathered from sandstone or limestone. Sapphire soils are on mountainsides. The mean annual precipitation is about 15 inches. The mean annual air temperature is about 35 degrees F.

Sapphire soils are near Duncom and Farlow soils. Duncom and Farlow soils, unlike Sapphire soils, do not have a B horizon.

Typical pedon of Sapphire fine sandy loam in an area of Sapphire-Duncom association, NE1/4SE1/4 sec. 31, T. 31 N., R. 99 W.:

O1—4 to 3 inches; pine needles, twigs, and leaves. (1 to 3 inches thick)
O2—3 inches to 0; decomposed organic matter. (1 to 5 inches thick)
A2—0 to 10 inches; light brownish gray (10YR 6/2) stony loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common medium roots; slightly acid (pH 6.4); abrupt smooth boundary. (6 to 12 inches thick)
A&B—10 to 18 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; moderate medium and coarse subangular blocky structure; slighty hard, friable, slightly sticky and slightly plastic; common medium roots; common moderately thick discontinuous clay films on peds; medium acid (pH 6.0); abrupt irregular boundary. (5 to 13 inches thick)
B&A—18 to 35 inches; pale brown (10YR 6/3) sandy clay loam, yellowish brown (10YR 5/4) moist; moderate medium and coarse subangular blocky structure; slighty hard, friable, slightly sticky and slightly plastic; many thin discontinuous clay films on peds; few fine roots; slightly acid (pH 6.2); clear irregular boundary. (14 to 20 inches thick)
Cr—35 to 41 inches; weathered, very pale brown (10YR 7/3) sandstone.

Depth to sandstone or limestone ranges from 20 to 40 inches.

Silas series

The Silas series consists of very deep, somewhat poorly drained, nearly level to gently sloping soils that formed in alluvium. Silas soils are on valley fill. The mean annual precipitation is about 15 inches. The mean annual air temperature is about 35 degrees F.

Silas soils are near Ansel, Farlow, and Midelight soils. Ansel soils, unlike Silas soils, have an argillic horizon. Farlow and Midelight soils, unlike Silas soils, do not have a thick mollic epipedon.

Typical pedon of Silas loam, SW1/4SW1/4 sec. 4, T. 30 N., R. 99 W.:

A11—0 to 3 inches; very dark gray (10YR 3/1) loam, black (10YR 2/1) moist; weak very fine crumb structure; soft, very friable, slightly sticky and slightly plastic; many very fine, medium, and coarse roots; few pebbles and cobbles; neutral (pH 6.8); abrupt smooth boundary. (2 to 10 inches thick)
A12—3 to 22 inches; very dark grayish brown (10YR 3/2) loam, very dark brown (10YR 2/2) moist; thin black (10YR 2/1) and very dark gray (10YR 3/1) lenses; massive; soft, very friable, slightly sticky and slightly plastic; many very fine, medium, and coarse roots; few pebbles and cobbles; neutral (pH 6.9); abrupt wavy boundary. (10 to 20 inches thick)
C—22 to 60 inches; brown (10YR 5/3) loam with thin strata of very fine sandy loam, silt loam, and clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; 10 percent gravel and 5 percent cobbles; neutral (pH 7.0).

This soil is 5 to 15 percent coarse fragments. The A horizon has hue of 2.5Y or 10YR. The C horizon has hue of 2.5Y to 7.5YR.

Sinkson series

The Sinkson series consists of very deep, well drained, nearly level to steep soils that formed in material weathered from red siltstone. Sinkson soils are on alluvial fans. The mean annual precipitation is about 14 inches. The mean annual air temperature is about 44 degrees F.

Sinkson soils are similar to Delphill and Patent soils and are near Thermopolis soils. Delphill and Patent soils, unlike Sinkson soils, have hue yellower than 7.5YR. Thermopolis soils, unlike Sinkson soils, are less than 20 inches deep over bedrock.

Typical pedon of Sinkson loam in an area of Thermopolis-Sinkson association, SE1/4NE1/4 sec. 5, T. 31 N., R. 98 W.:

A1—0 to 3 inches; red (2.5YR 4/6) loam, dark red (2.5YR 3/6) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; calcareous; moderately alkaline (pH 8.2); abrupt smooth boundary. (2 to 8 inches thick)

C—3 to 60 inches; red (2.5YR 5/6) loam, reddish brown (2.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and nonplastic; calcareous; moderately alkaline (pH 8.3).

This soil is 0 to 15 percent coarse fragments. The A horizon is brown to red very fine sandy loam, loam, or silt loam. The C horizon is reddish brown to red very fine sandy loam, loam, or silt loam.

Thermopolis series

The Thermopolis series consists of shallow, well drained, moderately sloping to steep soils that formed in material weathered from the underlying red siltstone. Thermopolis soils are on hills, ridges, and breaks. The mean annual precipitation is about 13 inches. The mean annual air temperature is about 44 degrees F.

Thermopolis soils are similar to Blazon soils and are near Sinkson soils. Blazon soils do not have red color. Sinkson soils, unlike Thermopolis soils, are more than 40 inches deep over bedrock.

Typical pedon of Thermopolis loam in an area of Thermopolis-Sinkson association, SE1/4NE1/4 sec. 5, T. 31 N., R. 98 W.:

A1—0 to 4 inches; reddish brown (2.5YR 5/4) loam, reddish brown (2.5YR 4/4) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; calcareous; moderately alkaline (pH 8.2); clear smooth boundary. (3 to 5 inches thick)

C1—4 to 15 inches; reddish brown (2.5YR 5/4) loam, reddish brown (2.5YR 4/4) moist; massive; hard, very friable, slightly sticky and slightly plastic; 10 percent siltstone pebbles; calcareous; moderately alkaline (pH 8.4); gradual wavy boundary. (5 to 17 inches thick)

C2r—15 to 25 inches; reddish brown (2.5YR 5/4), calcareous siltstone.

The solum ranges from 10 to 20 inches in thickness. Coarse fragments make up 0 to 35 percent of the solum. The A horizon is brown to light red loam or silt loam. The C horizon is reddish brown to light red loam or silt loam.

Formation of the soils

This section discusses the major factors of soil formation that affect the soils of the Lander Area and explains the formation of soil horizons.

Factors of soil formation

Soil is a natural formation of mineral and organic matter on the surface of the earth. Soil is capable of supporting plants. Soils differ in appearance, composition, productivity, and management requirements. The properties of a soil at any given place result from the integrated effects of five major factors of soil formation: parent material, living matter, climate, relief or topography, and time (*4*). No single factor is responsible for all of the soil differences. All of the factors act together, but at different rates, to form each individual soil. The relative importance of the factors varies from soil to soil.

Parent material

Many of the physical and chemical properties of the soils are influenced more by parent material than by climate or vegetation.

Eocene beds that make up the parent material of soils on the upper Beaver Rim covered much of the survey area. Carmody and Blackhall soils are associated with this formation. Remnants of these beds are found in the Atlantic City area.

The Lander Area is divided into six soil areas based on type of parent material.

Soils of the Lupinto-Lander map unit are on stream terraces and flood plains. The stream terraces are loamy parent material underlain by granitic gravel. The flood plains are stratified loamy parent material. Some flood plains are underlain by gravel.

Soils of the Patent-Forelle-Diamondville map unit formed in residuum and alluvium derived from mixed bedrock. Bedrock is of Tertiary, Cretaceous, and Jurassic age and is principally shale and interbedded sandstone, conglomerate, and limestone. Cretaceous and Jurassic bedrock is commonly tilted up toward the mountains. The Tertiary bedrock is a horizontal plain along Beaver Rim and in the northeastern part of the survey area. Much material has eroded from the bedrock and has been deposited as alluvial fans. Blazon, Diamondville, and Delphill soils formed in shale and soft sandstone. Carmody and Blackhall soils formed in material derived from light-colored Tertiary sandstone along Beaver Rim. Crownest and Cotha soils formed in material derived from the Cretaceous Mowry Formation. Havre soils developed in valley fill.

Soils of the Sinkson-Thermopolis map unit developed in residuum and alluvium derived from siltstone of the Triassic Chugwater Formation. Thermopolis soils formed in residuum and Sinkson soils formed in alluvium on alluvial fans and foot slopes. These soils inherited the red color of their parent material.

Soils of the Farlow-Duncom map unit are underlain by limestone and dolomite of Permian, Mississippian, and Ordovician age. Included in this map unit are soils that formed in material derived from Pennsylvanian Tensleep Sandstone. This association occurs along the front of the Wind River Mountains and on Sheep Mountain. Farlow and Duncom soils formed in material derived from limestone, and Sapphire soils formed in material derived from limestone and sandstone.

Soils of the Rock outcrop-Frisco map unit formed in alluvium derived from Precambrian granite in high mountain areas.

Soils of the Handran-Midelight map unit formed in residuum and alluvium in areas of Precambrian schist.

Living matter

Living matter is one of the active factors of soil formation. The other is climate. These active factors influence soil characteristics over wide areas. Living matter is all

forms of life on or in the soil, from microscopic bacteria to trees and mammals, including man. Living matter provides the biological environment that is important in changing inert rock material into soil.

One of the first stages of soil formation is the addition of organic matter.

Under grass-shrub vegetation in the basin part of the survey area, soils such as Forelle and Patent soils have slight accumulations of organic matter in the surface layer. Where there is grass or grass-shrub vegetation in the mountains, soils such as Silas soils accumulate more organic matter in the surface layer. Some very wet areas have a horizon of peat at the surface. Under forest, soils such as Frisco and Sapphire soils accumulate organic mulch over the mineral soil, and the mineral soil contains very little organic matter.

Man has strongly affected the characteristics of many of the soils in the survey area. Men have altered the natural soil horizons by cultivating and leveling the soil. For example, some soils that are now placed in the Patent series were classified as Forelle soils before leveling and cultivation.

Excessive irrigation has caused soils to become wet or saline in many areas. When the soil is saturated, air is excluded, iron in the soil is chemically reduced, and the soil becomes mottled and gleyed. Examples of this condition are found in Fluvents, saline. A water table also causes accumulation of soluble salts in the soil. The salt adversely affects plant growth and retards soil formation. Examples of this condition are the saline phases of the Patent series.

Climate

Climate has both direct and indirect effects on soil formation (4). The chief components of climate are precipitation, temperature, humidity, wind, and sunshine. Moisture from precipitation promotes leaching and physical, chemical, and biological activity. Leaching is the downward movement of soluble compounds by percolating water. The physical activity is the shrinking and swelling that occurs with changes in moisture content. Moisture combined with cold temperature promotes frost action. Indirectly, moisture affects the soil by its effect on vegetation. Temperature affects bedrock exposed on breaks by expansion, contraction, and frost action. Temperature indirectly affects soil formation by determining the length of the growing season. Humidity affects soil mainly through plant growth. In arid climates such as the eastern part of this survey area, wind erosion is very active in soil formation. The surface layer of many soils in this survey area has been reworked by wind. Sunshine promotes plant growth and warms the soil surface. A detailed account of the climate is included in the section "General nature of the area."

The impact of climate on the formation of a particular soil is determined in part by the physical characteristics of the parent material. Water intake is determined by the texture of the parent material. After soil formation has begun, soil structure also affects the infiltration and percolation of water.

Relief

Relief affects soil formation principally through its effect on microclimate and runoff.

The survey area extends from a structural basin to the tops of mountains. Bedrock generally slopes to the northeast. There is a wide variety of bedrock in the survey area. Soft shale and granite erode and form a rounded topography. Sandstone, siltstone, limestone, and hard shale tend to erode and form ledges. Thermopolis and Crownest soils commonly form on these ledges. Patent and Forelle soils are rolling. Soils that formed in alluvium are nearly level to gently sloping and are commonly on alluvial fans, stream terraces, or flood plains. Fluvaquents formed in swales and depressions.

Relief influences the microclimate, which influences vegetation, which in turn influences the development of the soil. This is an example of the interrelationship of the factors of soil formation and of their varying effects on soil properties. Relief influences microclimate and the wind pattern, which has an effect on precipitation and snowdrift.

Relief and runoff are interrelated. Steeper sloping soils commonly have more runoff and more erosion. Different kinds of bedrock erode at different rates, and in different configurations, forming varied topography.

Time

The length of time required for a soil to form depends largely on the other factors of soil formation. The relative age of a soil is reflected in its stage of formation. Soils are considered to be young or old largely based on measurable profile characteristics. A "mature" soil is in equilibrium with its environment over a sufficient period of time to have distinct genetic horizons. A "young" soil has little horizon development. Since radiocarbon dates are not available for soils in this survey area, absolute ages cannot be assigned.

Some soils that formed in alluvium, such as Lander and Patent soils, receive fresh parent material from flooding almost every year. In places, these soils contain thin layers of organic material laid down by the floods. These soils are young.

Some of the soils on relatively stable landforms are beginning to develop horizons. Organic matter has accumulated in the A horizon and illuviated clay has formed a B2t horizon, as in Ansel and Diamondville soils. Eluviation of bases from the A horizon and the upper part of the B horizon results in the accumulation of bases in the lower part of the B horizon or the upper part of the C horizon.

Delphill and Diamondville soils formed in similar parent material, but are at different stages of formation. Translocation of bases is much more advanced in Diamondville

soils than in Delphill soils. Diamondville soils also have a B2t horizon. This indicates that Diamondville soils are older than Delphill soils, as is also indicated by their positions on the landscape. Diamondville soils are on relatively stable ridges and hillsides, whereas Delphill soils are on dynamic slopes such as pediments and less stable hillsides.

Formation of horizons

The first stage in the formation of genetic soil horizons is the accumulation of humus to form the A horizon. Soils of the Lander, Patent, Sinkson, and Delphill series are in this stage of horizon formation.

As horizon formation continues, carbonates and other bases are leached from the solum, and the formation and translocation of silicate clay begins. In some soils in this survey area, base accumulation in the lower part of the B horizon and the upper part of the C horizon is detectable. In some of these same soils silicate clays are accumulating in the B2 horizon as indicated by clay films on peds and an increase in total clay.

Next, the profile is leached of carbonates and an argillic horizon (*7*) forms. Soils representative of this stage of formation are in the Forelle, Diamondville, and Ansel series.

In wet soils air is excluded from the soil by the water. Under these conditions, the absence of oxygen causes the reduction of iron. The iron imparts a gray or blue-gray color to the soil; this is called gleying. Fluvaquents have gleyed horizons.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	More than 9

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Deferred grazing. A delay in grazing until range plants have reached a specified stage of growth. Grazing is deferred in order to increase the vigor of forage and to allow desirable plants to produce seed. Contrasts with continuous grazing and rotation grazing.

Depth to rock. Bedrock at a depth that adversely affects the specified use.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Excess alkali. Excess exchangeable sodium. The resulting poor physical properties restrict the growth of plants.

Excess salts. Excess water-soluble salts. Excessive salts restrict the growth of most plants.

Fast intake. The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

Forb. Any herbaceous plant not a grass or a sedge.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or

browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land supporting some forest trees.

Range condition. The health or productivity of forage plants on a given range, in terms of the potential productivity under normal climate and the best practical management. Condition classes generally recognized are—*excellent*, *good*, *fair*, and *poor*. The classification is based on the percentage of original, or assumed, climax vegetation on a site, as compared to what has been observed to grow on it when well managed.

Range site. An area of range where climate, soil, and relief are sufficiently uniform to produce a distinct kind and amount of native vegetation.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces. Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline-alkali soil. A soil that contains a harmful concentration of salts and exchangeable sodium; contains harmful salts and is strongly alkaline; or contains harmful salts and exchangeable sodium and is very strongly alkaline. The salts, exchangeable sodium, and alkaline reaction are in the soil in such location that growth of most crop plants is less than normal.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Slick spot. Locally, a small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by

heavily loaded streams emerging from hills or mountains and spreading sediments onto the lowland as a series of adjacent alluvial fans.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Illustrations

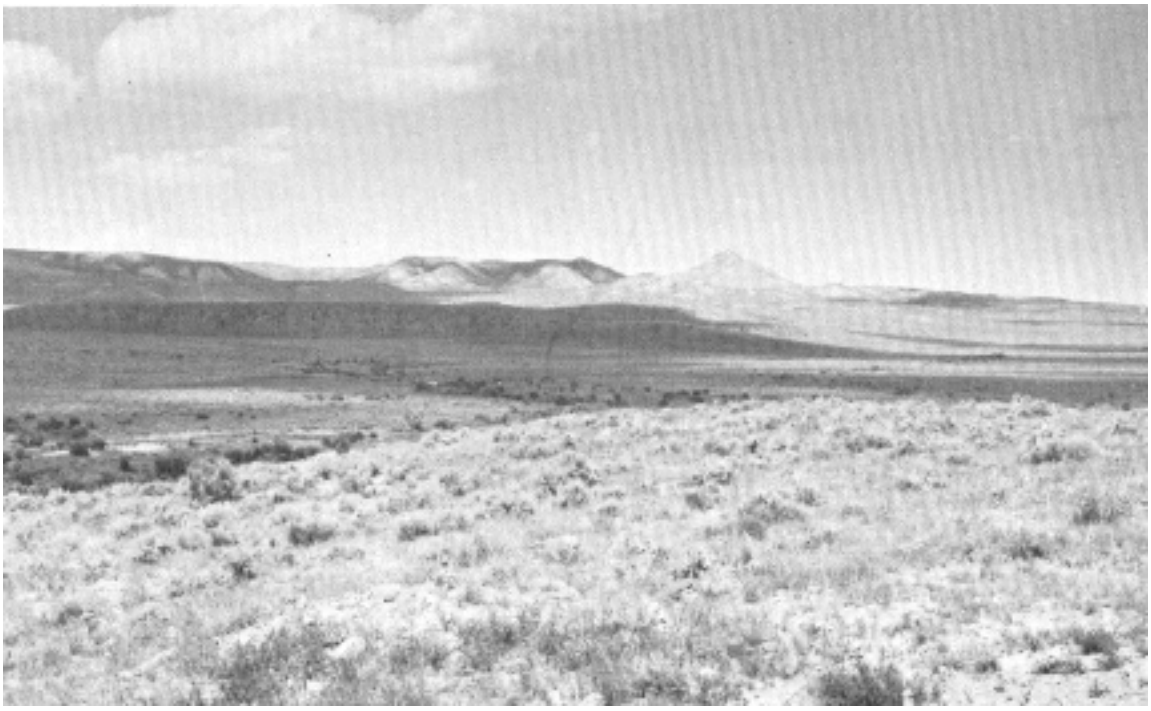

Figure 1.—Area of the Patent-Forelle-Diamondville map unit east of Lander.

Figure 2.—Area of the Sinkson-Thermopolis map unit in Red Canyon.

Figure 3.—Area of Rock outcrop-Frisco map unit near junction of Sawmill Creek and Loup Road.

Figure 4.—Area of the Handran-Midelight map unit near Miner's Delight.

Figure 5.—Area of Blackhall-Carmody association near Beaver Rim.

Figure 6.—Area of Farlow-Duncom association below a rock ledge in Sinks Canyon.

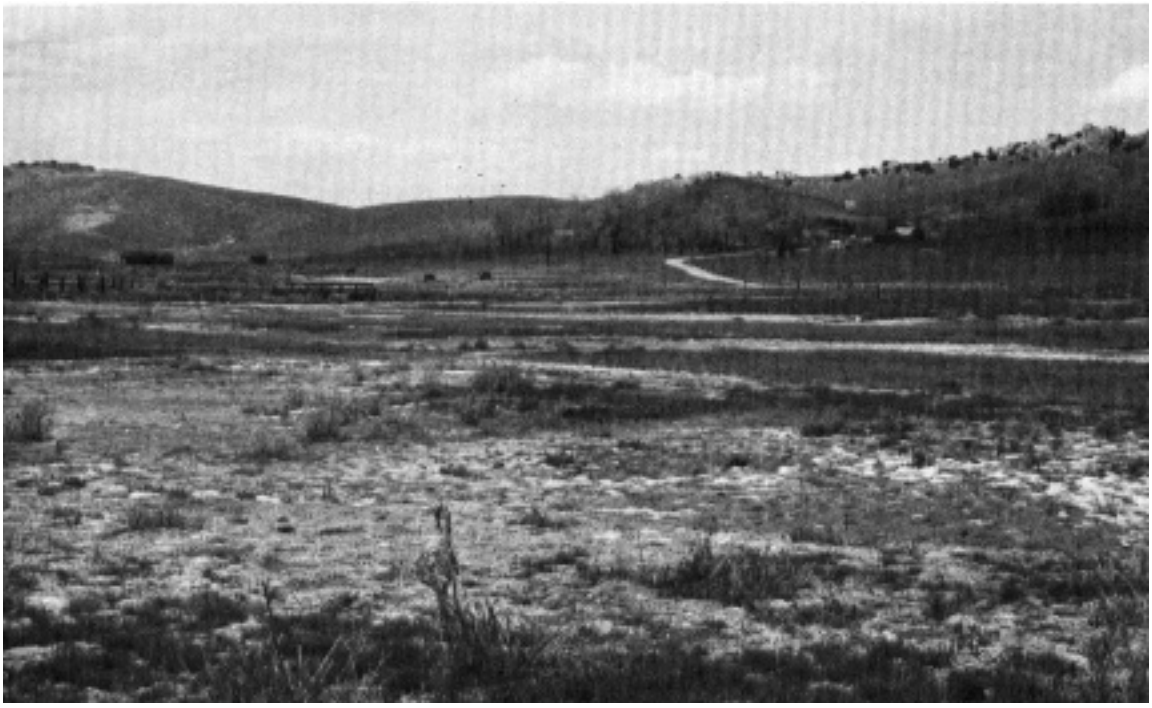

Figure 7.—Area of Fluvents, saline, about 5 miles southeast of Lander. A salt crust is on the surface.

Figure 8.—Granitic outcrop in an area of Rock outcrop-Handran association in the Shoshone National Forest.

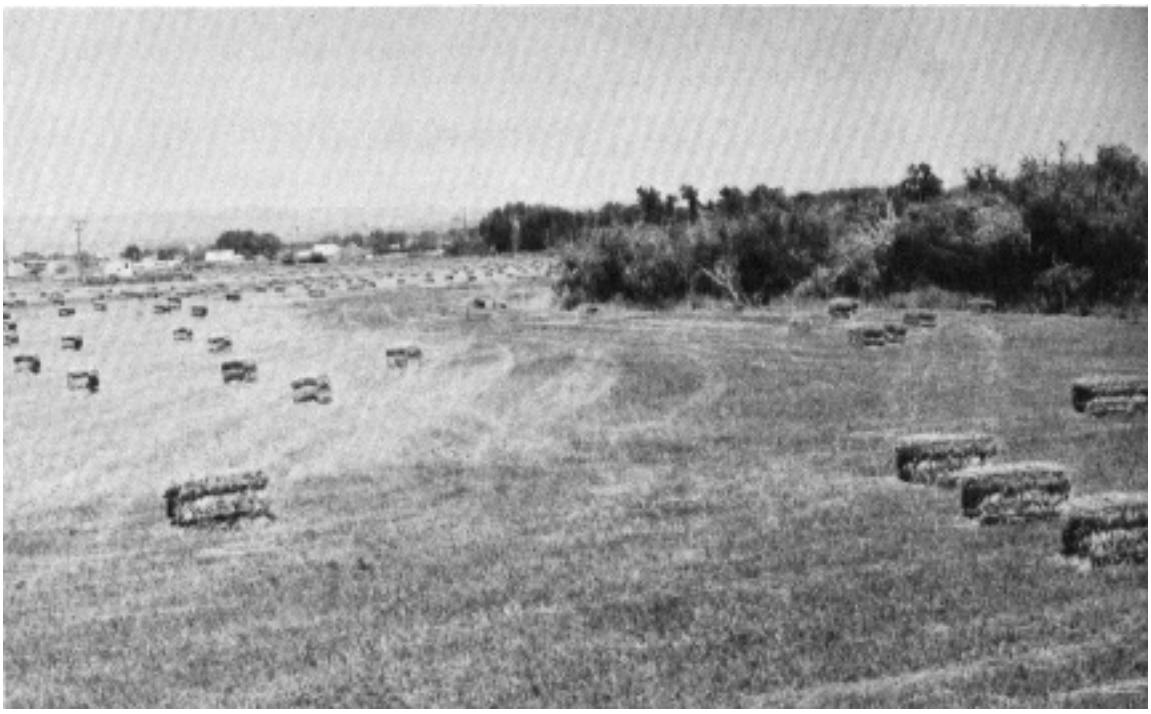

Figure 9.—Grass hay in an area of a Lupinto clay loam and Fluvaquents south of Lander along the Middle Popo Agie River.

Figure 10.—Typical woodland on Frisco soils in the Shoshone National Forest.

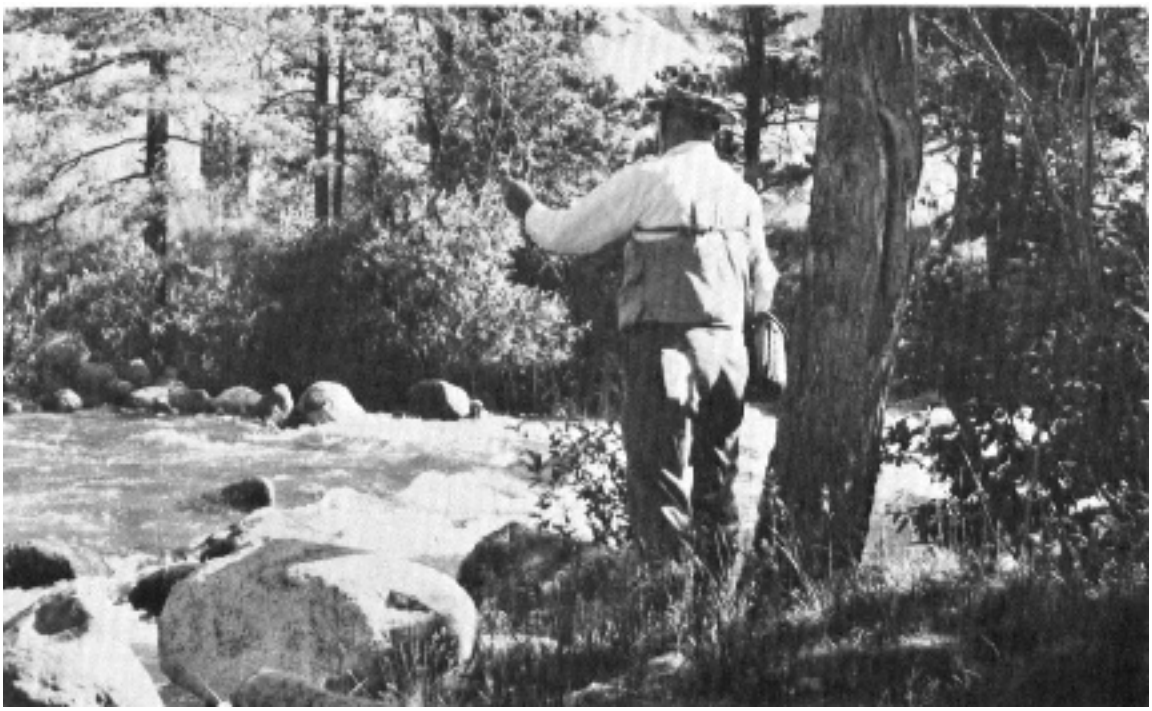

Figure 11.—Fishing on the Middle Popo Agie River in Sinks Canyon.

Figure 12.—Wortham Meadows Reservoir holds water for the town of Lander and is a recreation site.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

Month	Temperature[1]				Precipitation[1]				
	Average daily maximum	Average daily minimum	Average daily	Average number of growing degree days[2]	Average	Probability of measurable precipitation		Average number of days with 0.01 inch or more	Average snowfall
						day	night		
	°F	°F	°F		In	Pct	Pct		In
January--	31.1	8.0	19.6	12	0.48	8	8	4	8.8
February-	37.6	13.3	25.5	25	0.66	14	12	5	12.0
March----	43.5	19.3	31.4	47	1.18	17	17	8	18.6
April----	55.4	30.4	42.9	177	2.36	21	17	9	23.1
May------	65.9	39.7	52.8	406	2.59	22	20	9	5.7
June-----	74.9	47.4	61.2	636	1.93	13	10	7	1.8
July-----	86.0	55.1	70.6	949	0.61	9	11	6	0.0
August---	84.3	53.1	69.0	899	0.42	8	9	4	0.0
September	73.0	43.7	58.4	552	1.05	12	13	5	2.2
October--	60.2	33.4	46.8	264	1.24	11	9	5	10.5
November-	43.3	19.7	31.5	60	0.87	12	10	5	12.0
December-	34.3	11.6	23.0	17	0.45	10	8	4	9.5
Year----	57.5	31.3	44.4	4,044	13.84			71	104.2

[1]Recorded in the period 1941-70 at Lander.

[2]A growing degree day is an index of the amount of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Ansel loam	3,075	0.5
2	Blackhall-Carmody association	13,890	2.3
3	Blazon-Patent association	3,620	0.6
4	Blazon-Rock outcrop association	8,495	1.4
5	Cotha-Rock outcrop-Blazon association	10,155	1.6
6	Crownest-Cotha association	18,850	3.1
7	Delphill clay loam, 3 to 10 percent slopes	1,065	0.2
8	Diamondville sandy clay loam, 3 to 10 percent slopes	1,885	0.3
9	Diamondville sandy clay loam, 10 to 15 percent slopes	795	0.1
10	Diamondville-Forelle association	10,245	1.7
11	Diamondville-Highpoint association	7,710	1.3
12	Duncom-Farlow-Rock outcrop association	23,940	3.9
13	Elkol clay loam	820	0.1
14	Elkol-Patent association	1,810	0.3
15	Farlow-Duncom association	62,455	10.1
16	Fluvaquents	690	0.1
17	Fluvents, saline	2,030	0.3
19	Forelle sandy clay loam, 0 to 6 percent slopes	1,280	0.2
20	Forelle sandy clay loam, 6 to 10 percent slopes	940	0.2
21	Frisco-Handran-Rock outcrop association	64,300	10.4
22	Handran-Leavitt association	5,685	0.9
23	Handran-Midelight association	14,865	2.4
24	Havre clay loam	1,620	0.3
25	Havre-Elkol clay loams, saline	915	0.1
26	Havre complex	1,910	0.3
27	Irigul-Rock outcrop complex, 6 to 30 percent slopes	6,355	1.0
28	Lander loam	2,025	0.3
29	Lander complex	3,050	0.5
30	Leavitt loam	5,325	0.9
31	Leavitt-Rock outcrop association	4,765	0.8
32	Lupinto clay loam, 0 to 6 percent slopes	4,905	0.8
33	Lupinto clay loam, 6 to 10 percent slopes	550	0.1
34	Lupinto clay loam, 0 to 15 percent slopes	670	0.1
35	Lupinto clay loam, saline	365	0.1
36	Patent clay loam, 0 to 6 percent slopes	920	0.1
37	Patent clay loam, 6 to 10 percent slopes	550	0.1
38	Patent clay loam, saline	630	0.1
39	Patent-Forelle association	35,740	5.8
40	Rock outcrop	82,010	13.3
41	Rock outcrop-Handran association	126,020	20.3
42	Rock outcrop-Highpoint association	3,605	0.6
43	Sapphire-Duncom association	23,810	3.9
44	Silas loam	3,855	0.6
45	Sinkson loam, 0 to 6 percent slopes	1,765	0.3
46	Sinkson loam, 6 to 10 percent slopes	545	0.1
47	Sinkson-Thermopolis loams, 3 to 15 percent slopes	1,120	0.2
48	Sinkson-Thermopolis association	20,935	3.4
49	Thermopolis-Sinkson association	16,585	2.7
50	Ustic Torrifluvents-Aeric Fluvaquents complex	2,775	0.5
	Gravel pits	75	(1)
	Water	3,070	0.5
	Mine and dump	530	0.1
	Town of Lander	760	0.1
	Total	616,355	100.0

[1]Less than 0.1 percent.

TABLE 3.--CAPABILITY CLASSES AND SUBCLASSES

[All soils are assigned to nonirrigated capability subclasses (N). Only those potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Dashes mean no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	---	---	---	---	---
(I)	---	---	---	---	---
II (N)	---	---	---	---	---
(I)	3,132	3,132	---	---	---
III (N)	3,132	3,132	---	---	---
(I)	---	---	---	---	---
IV (N)	1,065	1,065	---	---	---
(I)	191	---	191	---	---
V (N)	690	---	690	---	---
VI (N)	179,165	160,566	11,992	6,607	---
VII (N)	175,251	131,614	---	43,637	---
VIII(N)	---	---	---	---	---

TABLE 4.--YIELDS PER ACRE OF CROPS AND PASTURE

[All yields were estimated for a high level of management in 1975. Absence of a yield figure indicates the crop is seldom grown or is not suited]

Soil name and map symbol	Alfalfa hay	Grass hay	Pasture
	Ton	Ton	AUM[1]
Diamondville:			
8	2.5	2.5	4.0
9	2.0	2.0	3.0
Elkol:			
13	---	2.0	3.5
Fluvents:			
17	---	2.0	4.0
Forelle:			
19	3.0	3.0	6.0
20	2.5	2.5	5.0
Havre:			
24	3.0	3.0	6.0
Lander:			
28	---	3.5	5.0
Lupinto:			
32	3.0	3.0	4.0
33	2.5	2.5	4.0
35	---	2.5	3.0
Patent:			
36	3.0	3.0	4.0
37	2.5	2.5	4.0
38	---	2.0	4.0
Sinkson:			
45	3.0	3.0	4.0
46	2.5	2.5	4.0

[1]Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for a period of 30 days.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Soils not listed are not in range sites; such soils can be used for grazing if grass cover is established]

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Blackhall:					
[1]2:					
Blackhall part--	Shallow loamy, 10- to 14-inch precipitation zone.	Favorable	700	Bluebunch wheatgrass	40
		Normal	500	Needleandthread	15
		Unfavorable	350	Indian ricegrass	10
				Western wheatgrass	10
				Big sagebrush	5
				Prairie junegrass	5
Carmody part	Loamy, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	35
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Big sagebrush	10
				Indian ricegrass	10
				Needleandthread	10
				Prairie junegrass	5
				Utah juniper	5
Blazon:					
[1]3:					
Blazon part	Shallow clayey, 10- to 14-inch precipitation zone.	Favorable	700	Bluebunch wheatgrass	40
		Normal	500	Indian ricegrass	10
		Unfavorable	350	Western wheatgrass	10
				Bottlebrush squirreltail	5
				Low rabbitbrush	5
				Big sagebrush	5
				Prairie junegrass	5
				Green needlegrass	5
				Sandberg bluegrass	5
Patent part	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	20
		Normal	800	Western wheatgrass	20
		Unfavorable	500	Big sagebrush	10
				Green needlegrass	10
				Canby bluegrass	5
				Cusick bluegrass	5
				Gardner saltbush	5
				Indian ricegrass	5
				Prairie junegrass	5
[1]4:					
Blazon part	Shallow clayey, 10- to 14-inch precipitation zone.	Favorable	700	Bluebunch wheatgrass	40
		Normal	500	Indian ricegrass	10
		Unfavorable	350	Western wheatgrass	10
				Bottlebrush squirreltail	5
				Low rabbitbrush	5
				Big sagebrush	5
				Prairie junegrass	5
				Green needlegrass	5
				Sandberg bluegrass	5
Rock outcrop part.					
Cotha:					
[1]5:					
Cotha part	Sandy, 10- to 14-inch precipitation zone.	Favorable	1,100	Needleandthread	15
		Normal	800	Streambank wheatgrass	10
		Unfavorable	500	Bluebunch wheatgrass	20
				Indian ricegrass	10
				Canby bluegrass	5
				Big sagebrush	10
				Low rabbitbrush	5
				Prairie junegrass	10
				Western wheatgrass	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Cotha:					
15:					
Rock outcrop part.					
Blazon part-----	Shallow clayey, 10- to 14-inch precipitation zone.	Favorable	700	Bluebunch wheatgrass----------	40
		Normal	500	Indian ricegrass----------	10
		Unfavorable	350	Western wheatgrass----------	10
				Bottlebrush squirreltail------	5
				Low rabbitbrush----------	5
				Big sagebrush----------	5
				Prairie junegrass----------	5
				Green needlegrass----------	5
				Sandberg bluegrass----------	5
Crownest:					
16:					
Crownest part---	Shallow sandy, 10- to 14-inch precipitation zone.	Favorable	700	Bluebunch wheatgrass----------	30
		Normal	500	Indian ricegrass----------	15
		Unfavorable	350	Needleandthread----------	15
				Prairie junegrass----------	10
				Big sagebrush----------	5
				Low rabbitbrush----------	5
				Sandberg bluegrass----------	5
				Western wheatgrass----------	5
Cotha part------	Sandy, 10- to 14-inch precipitation zone.	Favorable	1,100	Needleandthread----------	15
		Normal	800	Streambank wheatgrass----------	10
		Unfavorable	500	Bluebunch wheatgrass----------	20
				Indian ricegrass----------	10
				Canby bluegrass----------	5
				Big sagebrush----------	10
				Western wheatgrass----------	5
				Low rabbitbrush----------	5
				Prairie junegrass----------	10
Blazon part-----	Shallow clayey, 10- to 14-inch precipitation zone.	Favorable	700	Bluebunch wheatgrass----------	40
		Normal	500	Indian ricegrass----------	10
		Unfavorable	350	Western wheatgrass----------	10
				Bottlebrush squirreltail------	5
				Low rabbitbrush----------	5
				Big sagebrush----------	5
				Prairie junegrass----------	5
				Green needlegrass----------	5
				Sandberg bluegrass----------	5
Delphill:					
7----------	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass----------	20
		Normal	800	Big sagebrush----------	10
		Unfavorable	500	Cusick bluegrass----------	5
				Canby bluegrass----------	5
				Green needlegrass----------	10
				Indian ricegrass----------	5
				Prairie junegrass----------	5
				Western wheatgrass----------	20
				Gardner saltbush----------	5
Diamondville:					
8, 9----------	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass----------	20
		Normal	800	Big sagebrush----------	10
		Unfavorable	500	Cusick bluegrass----------	5
				Western wheatgrass----------	20
				Canby bluegrass----------	5
				Green needlegrass----------	10
				Indian ricegrass----------	5
				Prairie junegrass----------	5
				Gardner saltbush----------	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Diamondville:					
[1]10:					
Diamondville part	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	20
		Normal	800	Big sagebrush	10
		Unfavorable	500	Cusick bluegrass	5
				Western wheatgrass	20
				Canby bluegrass	5
				Green needlegrass	10
				Indian ricegrass	5
				Prairie junegrass	5
				Gardner saltbush	5
Forelle part	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	20
		Normal	800	Big sagebrush	10
		Unfavorable	500	Cusick bluegrass	5
				Western wheatgrass	20
				Green needlegrass	10
				Gardner saltbush	5
				Indian ricegrass	5
				Prairie junegrass	5
				Canby bluegrass	5
[1]11:					
Diamondville part	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	20
		Normal	800	Big sagebrush	10
		Unfavorable	500	Cusick bluegrass	5
				Western wheatgrass	20
				Canby bluegrass	5
				Green needlegrass	10
				Indian ricegrass	5
				Prairie junegrass	5
				Gardner saltbush	5
Highpoint part	Very shallow, 10- to 14-inch precipitation zone.	Favorable	600	Bluebunch wheatgrass	40
		Normal	400	Needleandthread	10
		Unfavorable	250	Antelope bitterbrush	5
				Black sagebrush	5
				Indian ricegrass	5
				Juniper	5
				Prairie junegrass	5
				Sandberg bluegrass	5
				Western wheatgrass	5
Duncom:					
[1]12:					
Duncom part	Shallow loamy, 15 inch and greater precipitation zone.	Favorable	1,000	Columbia needlegrass	10
		Normal	850	Idaho fescue	15
		Unfavorable	500	Mountain bromegrass	5
				Big sagebrush	5
				Spike-fescue	10
				Western wheatgrass	5
				Slender wheatgrass	5
				Sandberg bluegrass	5
				Prairie junegrass	10
				Bluebunch wheatgrass	5
				Black sagebrush	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Duncom:					
[1]12:					
Farlow part-----	Loamy, 15 inch and greater precipitation zone.	Favorable	1,600	Big sagebrush----------	10
		Normal	1,350	Idaho fescue----------	10
		Unfavorable	1,100	Slender wheatgrass----------	10
				Spike-fescue----------	10
				Western wheatgrass----------	10
				Big bluegrass----------	5
				Columbia needlegrass----------	5
				Mountain bromegrass----------	5
				Needleleaf sedge----------	5
				Prairie junegrass----------	5
				Sandberg bluegrass----------	5
Rock outcrop part.					
Elkol:					
13----------	Dense clay, 10- to 14-inch precipitation zone.	Favorable	650	Gardner saltbush----------	60
		Normal	450	Western wheatgrass----------	10
		Unfavorable	275	Bottlebrush squirreltail------	5
				Bud sagebrush----------	5
				Indian ricegrass----------	5
				Sandberg bluegrass----------	5
[1]14:					
Elkol part------	Dense clay, 10- to 14-inch precipitation zone.	Favorable	650	Gardner saltbush----------	60
		Normal	450	Western wheatgrass----------	10
		Unfavorable	275	Bottlebrush squirreltail------	5
				Bud sagebrush----------	5
				Indian ricegrass----------	5
				Sandberg bluegrass----------	5
Patent part-----	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass----------	20
		Normal	800	Western wheatgrass----------	20
		Unfavorable	500	Big sagebrush----------	10
				Green needlegrass----------	10
				Canby bluegrass----------	5
				Cusick bluegrass----------	5
				Gardner saltbush----------	5
				Indian ricegrass----------	5
				Prairie junegrass----------	5
Farlow:					
[1]15:					
Farlow part-----	Loamy, 15 inch and greater precipitation zone.	Favorable	1,600	Big sagebrush----------	10
		Normal	1,350	Idaho fescue----------	10
		Unfavorable	1,100	Slender wheatgrass----------	10
				Spike-fescue----------	10
				Western wheatgrass----------	10
				Big bluegrass----------	5
				Columbia needlegrass----------	5
				Mountain bromegrass----------	5
				Needleleaf sedge----------	5
				Prairie junegrass----------	5
				Sandberg bluegrass----------	5
Duncom part-----	Shallow loamy, 15 inch and greater precipitation zone.	Favorable	1,000	Columbia needlegrass----------	10
		Normal	850	Idaho fescue----------	15
		Unfavorable	500	Mountain bromegrass----------	5
				Big sagebrush----------	5
				Spike-fescue----------	10
				Western wheatgrass----------	5
				Slender wheatgrass----------	5
				Sandberg bluegrass----------	5
				Prairie junegrass----------	10
				Black sagebrush----------	5
				Bluebunch wheatgrass----------	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Fluvents:					
17	Saline subirrigated, 10- to 14-inch precipitation zone.	Favorable	2,800	Alkali cordgrass	5
		Normal	2,400	Alkali sacaton	55
		Unfavorable	1,600	Greasewood	5
				Inland saltgrass	5
				Nuttall alkaligrass	15
Forelle:					
19, 20	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,400	Thickspike wheatgrass	40
		Normal	1,100	Big sagebrush	10
		Unfavorable	600	Needleandthread	10
				Bluebunch wheatgrass	5
				Green needlegrass	5
				Needleleaf sedge	5
				Plains reedgrass	5
				Prairie junegrass	5
				Sandberg bluegrass	5
Frisco:					
[1]21:					
Frisco part.					
Handran part	Coarse uplands, 15 inch and greater precipitation zone.	Favorable	1,100	Big sagebrush	5
		Normal	950	Idaho fescue	10
		Unfavorable	600	Columbia needlegrass	10
				Western wheatgrass	10
				Bluebunch wheatgrass	10
				Prairie junegrass	10
				Mountain bromegrass	5
				Spike-fescue	10
				Onespike danthonia	5
				Sandberg bluegrass	5
Rock outcrop part.					
Handran:					
[1]22:					
Handran part	Coarse uplands, 15 inch and greater precipitation zone.	Favorable	1,100	Big sagebrush	5
		Normal	950	Idaho fescue	10
		Unfavorable	600	Columbia needlegrass	10
				Western wheatgrass	10
				Bluebunch wheatgrass	10
				Prairie junegrass	10
				Mountain bromegrass	5
				Spike-fescue	10
				Onespike danthonia	5
				Sandberg bluegrass	5
Leavitt part	Loamy, 15 inch and greater precipitation zone.	Favorable	1,600	Idaho fescue	10
		Normal	1,350	Western wheatgrass	10
		Unfavorable	1,100	Slender wheatgrass	10
				Big sagebrush	10
				Big bluegrass	5
				Spike-fescue	10
				Columbia needlegrass	5
				Mountain bromegrass	5
				Needleleaf sedge	5
				Prairie junegrass	5
				Sandberg bluegrass	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Handran:					
[1]23:					
Handran part----	Coarse uplands, 15 inch and greater precipitation zone.	Favorable	1,100	Big sagebrush----------	5
		Normal	950	Idaho fescue----------	10
		Unfavorable	600	Columbia needlegrass----------	10
				Western wheatgrass----------	10
				Bluebunch wheatgrass----------	10
				Prairie junegrass----------	10
				Nodding bromegrass----------	5
				Spike-fescue----------	10
				Onespike danthonia----------	5
				Sandberg bluegrass----------	5
Midelight part--	Coarse uplands, 15 inch and greater precipitation zone.	Favorable	1,100	Bluebunch wheatgrass----------	10
		Normal	950	Columbia needlegrass----------	10
		Unfavorable	600	Idaho fescue----------	10
				Prairie junegrass----------	10
				Spike-fescue----------	10
				Western wheatgrass----------	10
				Big sagebrush----------	5
				Mountain bromegrass----------	5
				Onespike danthonia----------	5
				Sandberg bluegrass----------	5
Havre:					
24----------	Lowland, 10- to 14-inch precipitation zone.	Favorable	1,500	Basin wildrye----------	15
		Normal	1,200	Big sagebrush----------	5
		Unfavorable	900	Canby bluegrass----------	5
				Cottonwood----------	5
				Green needlegrass----------	10
				Kentucky bluegrass----------	5
				Prairie sandreed----------	5
				Rubber rabbitbrush----------	5
				Silver buffaloberry----------	5
				Slender wheatgrass----------	10
				Threadleaf sedge----------	5
				Western wheatgrass----------	10
[1]25:					
Havre part------	Lowland, 10- to 14-inch precipitation zone.	Favorable	1,500	Basin wildrye----------	15
		Normal	1,200	Big sagebrush----------	5
		Unfavorable	900	Canby bluegrass----------	5
				Cottonwood----------	5
				Green needlegrass----------	10
				Kentucky bluegrass----------	5
				Prairie sandreed----------	5
				Rubber rabbitbrush----------	5
				Silver buffaloberry----------	5
				Slender wheatgrass----------	10
				Threadleaf sedge----------	5
				Western wheatgrass----------	10
Elkol part------	Dense clay, 10- to 14-inch precipitation zone.	Favorable	650	Gardner saltbush----------	60
		Normal	450	Western wheatgrass----------	10
		Unfavorable	275	Bottlebrush squirreltail------	5
				Bud sagebrush----------	5
				Indian ricegrass----------	5
				Sandberg bluegrass----------	5
[1]26:					
Havre part------	Lowland, 10- to 14-inch precipitation zone.	Favorable	1,500	Basin wildrye----------	15
		Normal	1,200	Big sagebrush----------	5
		Unfavorable	900	Canby bluegrass----------	5
				Cottonwood----------	5
				Green needlegrass----------	10
				Kentucky bluegrass----------	5
				Prairie sandreed----------	5
				Rubber rabbitbrush----------	5
				Silver buffaloberry----------	5
				Slender wheatgrass----------	10
				Threadleaf sedge----------	5
				Western wheatgrass----------	10

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Havre:					
[1]26:					
Havre, seeped part	Saline subirrigated, 10- to 14-inch precipitation zone.	Favorable	2,800	Alkali cordgrass	5
		Normal	2,400	Alkali sacaton	55
		Unfavorable	1,600	Greasewood	5
				Inland saltgrass	5
				Nuttall alkaligrass	15
Elkol part.					
Irigul:					
[1]27:					
Irigul part	Igneous, 15 inch and greater precipitation zone.	Favorable	950	Black sagebrush	10
		Normal	800	Columbia needlegrass	10
		Unfavorable	450	Idaho fescue	10
				Bluebunch wheatgrass	5
				California danthonia	5
				Mountain muhly	5
				Onespike danthonia	5
				Prairie junegrass	5
				Sandberg bluegrass	5
				Slender wheatgrass	5
				Threetip sagebrush	5
				Western wheatgrass	5
Rock outcrop part.					
Lander:					
28, [1]29	Subirrigated, 10- to 14-inch precipitation zone.	Favorable	4,500	Basin wildrye	20
		Normal	3,600	Dogwood	10
		Unfavorable	2,800	Slender wheatgrass	10
				Bluejoint reedgrass	5
				Boxelder	5
				Canby bluegrass	5
				Kentucky bluegrass	5
				Sandberg bluegrass	5
				Streambank wheatgrass	5
				Tufted hairgrass	5
				Western wheatgrass	5
				Willow	5
Leavitt:					
30	Loamy, 15 inch and greater precipitation zone.	Favorable	1,600	Idaho fescue	10
		Normal	1,300	Western wheatgrass	10
		Unfavorable	1,100	Slender wheatgrass	10
				Big sagebrush	10
				Big bluegrass	5
				Spike-fescue	10
				Columbia needlegrass	5
				Mountain bromegrass	5
				Needleleaf sedge	5
				Prairie junegrass	5
				Sandberg bluegrass	5
[1]31:					
Leavitt part	Loamy, 15 inch and greater precipitation zone.	Favorable	1,600	Idaho fescue	10
		Normal	1,300	Western wheatgrass	10
		Unfavorable	1,100	Slender wheatgrass	10
				Big sagebrush	10
				Big bluegrass	5
				Spike-fescue	10
				Columbia needlegrass	5
				Mountain bromegrass	5
				Needleleaf sedge	5
				Prairie junegrass	5
				Sandberg bluegrass	5
Rock outcrop part.					

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Lupinto:					
32, 33, 34	Loamy, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	35
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Big sagebrush	10
				Indian ricegrass	10
				Needleandthread	10
				Prairie junegrass	5
35	Saline subirrigated, 10- to 14-inch precipitation zone.	Favorable	2,800	Alkali cordgrass	5
		Normal	2,400	Alkali sacaton	55
		Unfavorable	1,600	Greasewood	5
				Inland saltgrass	5
				Nuttall alkaligrass	15
Patent:					
36, 37	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	20
		Normal	800	Western wheatgrass	20
		Unfavorable	500	Big sagebrush	10
				Green needlegrass	10
				Canby bluegrass	5
				Cusick bluegrass	5
				Gardner saltbush	5
				Indian ricegrass	5
				Prairie junegrass	5
38	Saline subirrigated, 10- to 14-inch precipitation zone.	Favorable	2,800	Alkali cordgrass	5
		Normal	2,400	Alkali sacaton	55
		Unfavorable	1,600	Greasewood	5
				Inland saltgrass	5
				Nuttall alkaligrass	15
[1]39:					
Patent part	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	20
		Normal	800	Western wheatgrass	20
		Unfavorable	500	Big sagebrush	10
				Green needlegrass	10
				Canby bluegrass	5
				Cusick bluegrass	5
				Gardner saltbush	5
				Indian ricegrass	5
				Prairie junegrass	5
Forelle part	Clayey, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	20
		Normal	800	Big sagebrush	10
		Unfavorable	500	Cusick bluegrass	5
				Western wheatgrass	20
				Green needlegrass	10
				Indian ricegrass	5
				Gardner saltbush	5
				Prairie junegrass	5
				Canby bluegrass	5
Rock outcrop:					
[1]42:					
Rock outcrop part.					
Highpoint part	Very shallow, 10- to 14-inch precipitation zone.	Favorable	600	Bluebunch wheatgrass	40
		Normal	400	Needleandthread	10
		Unfavorable	250	Antelope bitterbrush	5
				Black sagebrush	5
				Indian ricegrass	5
				Juniper	5
				Prairie junegrass	5
				Sandberg bluegrass	5
				Western wheatgrass	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Sapphire:					
143:					
Sapphire part.					
Duncom part	Shallow loamy, 15 inch and greater precipitation zone.	Favorable	1,000	Columbia needlegrass	10
		Normal	850	Idaho fescue	15
		Unfavorable	500	Mountain bromegrass	5
				Big sagebrush	5
				Spike-fescue	10
				Western wheatgrass	5
				Sandberg bluegrass	5
				Bluebunch wheatgrass	5
				Prairie junegrass	10
				Black sagebrush	5
				Slender wheatgrass	5
Silas:					
44	Subirrigated, 15 inch and greater precipitation zone.	Favorable	4,600	Nebraska sedge	15
		Normal	3,800	Northern reedgrass	10
		Unfavorable	3,000	Sedge	10
				Alpine timothy	5
				Idaho fescue	5
				Mat muhly	5
				Meadow barley	5
				Shrubby cinquefoil	5
				Slender wheatgrass	5
Sinkson:					
45, 46	Loamy, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	35
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Big sagebrush	10
				Indian ricegrass	10
				Needleandthread	10
				Prairie junegrass	5
147:					
Sinkson part	Loamy, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	35
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Big sagebrush	10
				Indian ricegrass	10
				Needleandthread	10
				Prairie junegrass	5
Thermopolis part	Shallow loamy, 10- to 14-inch precipitation zone.	Favorable	700	Bluebunch wheatgrass	40
		Normal	500	Needleandthread	15
		Unfavorable	350	Indian ricegrass	10
				Western wheatgrass	10
				Big sagebrush	5
				Prairie junegrass	5
148:					
Sinkson part	Loamy, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	35
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Big sagebrush	10
				Indian ricegrass	10
				Needleandthread	10
				Prairie junegrass	5
Thermopolis part	Shallow loamy, 10- to 14-inch precipitation zone.	Favorable	700	Bluebunch wheatgrass	40
		Normal	500	Needleandthread	15
		Unfavorable	350	Indian ricegrass	10
				Western wheatgrass	10
				Big sagebrush	5
				Prairie junegrass	5

See footnote at end of table.

TABLE 5.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site name	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
Thermopolis: [1]49:					
Thermopolis part	Shallow loamy, 10- to 14-inch precipitation zone.	Favorable	700	Bluebunch wheatgrass	40
		Normal	500	Needleandthread	15
		Unfavorable	350	Indian ricegrass	10
				Western wheatgrass	10
				Big sagebrush	5
				Prairie junegrass	5
Sinkson part	Loamy, 10- to 14-inch precipitation zone.	Favorable	1,100	Bluebunch wheatgrass	35
		Normal	800	Western wheatgrass	15
		Unfavorable	500	Big sagebrush	10
				Indian ricegrass	10
				Needleandthread	10
				Prairie junegrass	5
Ustic Torrifluvents: [1]50:					
Ustic Torrifluvents part	Lowland, 10- to 14-inch precipitation zone.	Favorable	4,500	Basin wildrye	20
		Normal	3,600	Dogwood	10
		Unfavorable	2,800	Slender wheatgrass	10
				Bluejoint reedgrass	5
				Boxelder	5
				Canby bluegrass	5
				Kentucky bluegrass	5
				Sandberg bluegrass	5
				Streambank wheatgrass	5
				Tufted hairgrass	5
				Western wheatgrass	5
				Willow	5
Aeric Fluvaquents part	Subirrigated, 10- to 14-inch precipitation zone.	Favorable	4,500	Basin wildrye	20
		Normal	3,600	Dogwood	10
		Unfavorable	2,800	Slender wheatgrass	10
				Bluejoint reedgrass	5
				Boxelder	5
				Canby bluegrass	5
				Kentucky bluegrass	5
				Sandberg bluegrass	5
				Streambank wheatgrass	5
				Tufted hairgrass	5
				Western wheatgrass	5
				Willow	5

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed in this table. Absence of an entry in a column means the information was not available]

Soil name and map symbol	Ordination symbol	Management concerns					Potential productivity	
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition	Important trees	Site index
Ansel:								
[1]----------	6o	Moderate	Slight	Moderate	Slight	Moderate	Lodgepole pine----------	53
							Limber pine----------	---
Frisco:								
[1]21:								
Frisco part-----	5o	---------	---------	---------	---------	---------	Lodgepole pine----------	58
							Limber pine----------	---
							Douglas-fir----------	---
Handran part.								
Rock outcrop part.								
Rock outcrop:								
[1]41:								
Rock outcrop part.								
Handran part.								
Frisco part-----	5o	---------	---------	---------	---------	---------	Douglas-fir----------	---
							Lodgepole pine----------	50
							Limber pine----------	---
Sapphire:								
[1]43:								
Sapphire part---	4r	Moderate	Severe	Slight	Moderate	Moderate	Lodgepole pine----------	70
							Douglas-fir----------	---
Duncom part.								

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 7.--WOODLAND UNDERSTORY VEGETATION

[Only the soils suitable for production of commercial trees are listed]

Soil name and map symbol	Total production		Characteristic vegetation	Composition
	Kind of year	Dry weight		
		Lb/acre		Pct
Ansel:				
[1]----------	Favorable	300	Elk sedge----------	30
	Normal	250	Mountain bromegrass----------	15
	Unfavorable	200	Bluegrass----------	15
			Shrubby cinquefoil----------	7
			Rose----------	5
Frisco:				
[1]21:				
Frisco part-----	Favorable	250	Low juniper----------	30
	Normal	200	Elk sedge----------	15
	Unfavorable	175	Bluegrass----------	10
			Mountain snowberry----------	10
Handran part.				
Rock outcrop part.				
Rock outcrop:				
[1]41:				
Rock outcrop part.				
Handran part.				
Frisco part-----	Favorable	250	Low juniper----------	30
	Normal	200	Elk sedge----------	15
	Unfavorable	175	Bluegrass----------	10
			Mountain snowberry----------	10
Sapphire:				
[1]43:				
Sapphire part---	Favorable	250	Low juniper----------	30
	Normal	200	Elk sedge----------	15
	Unfavorable	175	Bluegrass----------	15
			Mountain snowberry----------	10
Duncom part.				

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 8.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Ansel:					
1	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Blackhall:					
2:					
Blackhall part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Carmody part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Blazon:					
3:					
Blazon part	Moderate: slope, depth to rock.	Moderate: slope, depth to rock.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, depth to rock, low strength.
Patent part	Moderate: slope, too clayey.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: low strength.
4:					
Blazon part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop part.					
Cotha:					
5:					
Cotha part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop part.					
Blazon part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Crownest:					
6:					
Crownest part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Cotha part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Blazon part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Delphill:					
7	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action, low strength.
Diamondville:					
8	Moderate: depth to rock.	Moderate: low strength.	Moderate: low strength, depth to rock.	Moderate: slope, low strength.	Severe: low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Diamondville:					
9	Moderate: slope, depth to rock.	Moderate: slope, low strength.	Moderate: slope, low strength, depth to rock.	Severe: slope.	Severe: low strength.
110:					
Diamondville part	Moderate: depth to rock.	Moderate: low strength.	Moderate: low strength, depth to rock.	Moderate: slope, low strength.	Severe: low strength.
Forelle part	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Moderate: low strength, shrink-swell.
111:					
Diamondville part	Moderate: slope, depth to rock.	Moderate: slope, low strength.	Moderate: slope, low strength, depth to rock.	Severe: slope.	Severe: low strength.
Highpoint part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Duncom:					
112:					
Duncom part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Farlow part	Severe: slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop part.					
Elkol:					
13	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
114:					
Elkol part	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Patent part	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Severe: low strength.
Farlow:					
115:					
Farlow part	Severe: slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Duncom part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Fluvaquents:					
16	Severe: wetness.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Fluvents:					
17	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: wetness.
Forelle:					
19	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength, shrink-swell.
20	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength, shrink-swell.
Frisco:					
[1]21:					
Frisco part	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Handran part	Severe: slope, large stones, small stones.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: slope.
Rock outcrop part.					
Handran:					
[1]22:					
Handran part	Severe: slope, large stones, small stones.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: slope.
Leavitt part	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Moderate: shrink-swell, low strength, frost action.
[1]23:					
Handran part	Severe: large stones, small stones.	Severe: large stones, slope.	Severe: large stones.	Severe: large stones, slope.	Moderate: slope, large stones.
Midelight part	Severe: small stones.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.
Havre:					
24	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, low strength, shrink-swell.
[1]25:					
Havre part	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, low strength, shrink-swell.
Elkol part	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Havre:					
[1]26:					
Havre part	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, low strength, shrink-swell.
Elkol part	Severe: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.
Havre, seeped, part.	Moderate: wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, low strength, shrink-swell.
Irigul:					
[1]27:					
Irigul part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Rock outcrop part.					
Lander:					
28, [1]29	Severe: floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods, frost action.
Leavitt:					
30	Moderate: too clayey.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength, frost action.
[1]31:					
Leavitt part	Moderate: slope, too clayey.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Moderate: slope, shrink-swell, low strength.
Rock outcrop part.					
Lupinto:					
32	Severe: small stones, cutbanks cave.	Slight	Slight	Slight	Slight.
33	Severe: small stones, cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.
34	Severe: small stones, cutbanks cave.	Slight	Slight	Moderate: slope.	Slight.
35	Severe: wetness, cutbanks cave, small stones.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.
Patent:					
36	Moderate: too clayey.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Severe: low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Patent:					
37	Moderate: slope, too clayey.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe. low strength.
38	Severe: wetness.	Moderate: low strength, shrink-swell, wetness.	Severe: wetness.	Moderate: low strength, wetness.	Severe: low strength.
[1]39:					
Patent part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.
Forelle part	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength, shrink-swell.
Rock outcrop:					
40.					
[1]41:					
Rock outcrop part.					
Handran part	Severe: slope, large stones, small stones.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: slope.
Frisco part	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
[1]42:					
Rock outcrop part.					
Highpoint part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sapphire:					
[1]43:					
Sapphire part	Severe: depth to rock, slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, frost action.
Duncom part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.
Silas:					
44	Moderate: depth to rock, wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: low strength, frost action, shrink-swell.
Sinkson:					
45	Slight	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.
46	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.
[1]47:					
Sinkson part	Moderate: slope.	Moderate: slope, low strength.	Moderate: slope, low strength.	Severe: slope.	Moderate: slope, low strength.

See footnote at end of table.

TABLE 8.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets
Sinkson: [1]47:					
Thermopolis part	Moderate: slope, depth to rock.	Moderate: slope, depth to rock, low strength.	Moderate: slope, depth to rock, low strength.	Severe: slope.	Moderate: slope, depth to rock, low strength.
[1]48:					
Sinkson part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Thermopolis part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Thermopolis: [1]49:					
Thermopolis part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sinkson part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ustic Torrifluvents: [1]50:					
Ustic Torrifluvents part	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Aeric Fluvaquents part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 9.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms used to rate soils. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ansel:					
1	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Blackhall:					
2:					
Blackhall part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.
Carmody part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Blazon:					
3:					
Blazon part	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer.
Patent part	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
4:					
Blazon part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer.
Rock outcrop part.					
Cotha:					
5:					
Cotha part	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: slope.
Rock outcrop part.					
Blazon part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer.
Crownest:					
6:					
Crownest part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer, area reclaim.
Cotha part	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: slope.
Blazon part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer.
Delphill:					
7	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Diamondville:					
8	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer, area reclaim.
9	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: slope, thin layer, area reclaim.
[1]10:					
Diamondville part	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer, area reclaim.
Forelle part	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
[1]11:					
Diamondville part	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Fair: slope, thin layer, area reclaim.
Highpoint part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, small stones.
Duncom:					
[1]12:					
Duncom part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Farlow part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, small stones.
Rock outcrop part.					
Elkol:					
13	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
[1]14:					
Elkol part	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Patent part	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
Farlow:					
[1]15:					
Farlow part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, small stones.
Duncom part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Fluvaquents:					
16	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Fluvents:					
17	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Forelle:					
19	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
20	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
Frisco:					
†21:					
Frisco part	Severe: large stones, slope.	Severe: slope, large stones, seepage.	Severe: slope, large stones.	Severe: slope, seepage.	Poor: large stones, slope, small stones.
Handran part	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Rock outcrop part.					
Handran:					
†22:					
Handran part	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Leavitt part	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
†23:					
Handran part	Moderate: slope.	Severe: seepage, slope, large stones.	Severe: seepage, large stones.	Severe: seepage.	Poor: large stones.
Midelight part	Severe: depth to rock.	Severe: slope, small stones.	Severe: depth to rock.	Moderate: slope.	Poor: small stones.
Havre:					
24	Moderate: percs slowly, floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Fair: too clayey.
†25:					
Havre part	Moderate: percs slowly, floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Fair: wetness, too clayey.
Elkol part	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
†26:					
Havre part	Moderate: percs slowly, floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Fair: too clayey.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Havre:					
[1]26:					
Elkol part	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Havre, seeped, part.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Irigul:					
[1]27:					
Irigul part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Rock outcrop part.					
Lander:					
28, [1]29	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Good.
Leavitt:					
30	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
[1]31:					
Leavitt part	Moderate: slope, percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
Rock outcrop part.					
Lupinto:					
32	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
33	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
34	Slight	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
35	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: thin layer, area reclaim, small stones.
Patent:					
36	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
37	Moderate: percs slowly, slope.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
38	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
[1]39:					
Patent part	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Patent:					
139:					
Forelle part	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
Rock outcrop:					
40.					
141:					
Rock outcrop part.					
Handran part	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Frisco part	Severe: large stones, slope.	Severe: slope, large stones, seepage.	Severe: slope, large stones.	Severe: slope, seepage.	Poor: large stones, slope, small stones.
142:					
Rock outcrop part.					
Highpoint part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, small stones.
Sapphire:					
143:					
Sapphire part	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, large stones.
Duncom part	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Silas:					
44	Moderate: wetness, floods, depth to rock.	Severe: floods.	Severe: depth to rock, wetness.	Moderate: floods, wetness.	Good.
Sinkson:					
45	Moderate: percs slowly.	Moderate: slope, seepage.	Slight	Slight	Good.
46	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
147:					
Sinkson part	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
Thermopolis part	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer, area reclaim.
148:					
Sinkson part	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 9.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Sinkson: [1]48:					
Thermopolis part-	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Thermopolis: [1]49:					
Thermopolis part-	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Poor: slope, thin layer, area reclaim.
Sinkson part-----	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Ustic Torrifluvents: [1]50:					
Ustic Torrifluvents part----------	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Poor: wetness.
Aeric Fluvaquents part----------	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 10.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," and "unsuited." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ansel:				
1	Poor: low strength.	Unsuited	Unsuited	Poor: slope.
Blackhall:				
2:				
Blackhall part	Poor: slope, thin layer.	Unsuited	Unsuited	Poor: slope, small stones.
Carmody part	Fair: slope, low strength, area reclaim.	Unsuited	Unsuited	Poor: slope, area reclaim.
Blazon:				
3:				
Blazon part	Poor: thin layer.	Unsuited	Unsuited	Poor: area reclaim.
Patent part	Poor: low strength.	Unsuited	Unsuited	Fair: slope, too clayey.
4:				
Blazon part	Poor: slope, thin layer.	Unsuited	Unsuited	Poor: slope, area reclaim.
Rock outcrop part.				
Cotha:				
5:				
Cotha part	Poor: thin layer.	Poor: excess fines.	Unsuited	Poor: slope.
Rock outcrop part.				
Blazon part	Poor: thin layer.	Unsuited	Unsuited	Poor: slope, area reclaim.
Crownest:				
6:				
Crownest part	Poor: thin layer, area reclaim.	Poor: excess fines.	Unsuited	Poor: slope, area reclaim.
Cotha part	Poor: thin layer.	Poor: excess fines.	Unsuited	Poor: slope.
Blazon part	Poor: thin layer.	Unsuited	Unsuited	Poor: slope, area reclaim.
Delphill:				
7	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Fair: too clayey.
Diamondville:				
8	Poor: thin layer, area reclaim, low strength.	Unsuited	Unsuited	Fair: thin layer, area reclaim.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Diamondville:				
9	Poor: thin layer, area reclaim, low strength.	Unsuited	Unsuited	Fair: slope, thin layer, area reclaim.
[1]10:				
Diamondville part	Poor: thin layer, area reclaim, low strength.	Unsuited	Unsuited	Fair: thin layer, area reclaim.
Forelle part	Fair: low strength.	Unsuited	Unsuited	Good.
[1]11:				
Diamondville part	Poor: thin layer, area reclaim, low strength.	Unsuited	Unsuited	Fair: slope, thin layer, area reclaim.
Highpoint part	Poor: slope, thin layer, area reclaim.	Unsuited	Poor: excess fines.	Poor: slope, thin layer, small stones.
Duncom:				
[1]12:				
Duncom part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, area reclaim.
Farlow part	Poor: slope.	Unsuited	Unsuited	Poor: slope, small stones.
Rock outcrop part.				
Elkol:				
13	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess sodium, thin layer.
[1]14:				
Elkol part	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess sodium, thin layer.
Patent part	Poor: low strength.	Unsuited	Unsuited	Fair: too clayey.
Farlow:				
[1]15:				
Farlow part	Poor: slope.	Unsuited	Unsuited	Poor: slope, small stones.
Duncom part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, area reclaim.
Fluvaquents:				
16	Poor: wetness.	Unsuited	Unsuited	Poor: wetness.
Fluvents:				
17	Fair: wetness.	Unsuited	Unsuited	Poor: excess salt.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Forelle:				
19	Fair: low strength.	Unsuited	Unsuited	Good.
20	Fair: low strength.	Unsuited	Unsuited	Fair: slope.
Frisco:				
[1]21:				
Frisco part	Severe: slope.	Unsuited	Unsuited	Poor: small stones, slope.
Handran part	Poor: large stones, slope.	Unsuited: large stones.	Unsuited: large stones.	Poor: slope, large stones.
Rock outcrop part.				
Handran:				
[1]22:				
Handran part	Poor: large stones.	Unsuited: large stones.	Unsuited: large stones.	Poor: slope, large stones.
Leavitt part	Fair: shrink-swell, low strength, frost action.	Unsuited	Unsuited	Fair: too clayey.
[1]23:				
Handran part	Poor: large stones.	Unsuited: large stones.	Unsuited: large stones.	Poor: small stones.
Midelight part	Fair: area reclaim, frost action.	Unsuited	Poor: excess fines.	Poor: small stones.
Havre:				
24	Fair: frost action, low strength, shrink-swell.	Unsuited	Unsuited	Fair: too clayey.
[1]25:				
Havre part	Fair: frost action, low strength, shrink-swell.	Unsuited	Unsuited	Fair: too clayey.
Elkol part	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess sodium, thin layer.
[1]26:				
Havre part	Fair: frost action, low strength, shrink-swell.	Unsuited	Unsuited	Fair: too clayey.
Elkol part	Poor: low strength, shrink-swell.	Unsuited	Unsuited	Poor: excess sodium, thin layer.
Havre, seeped, part.	Fair: frost action, low strength, wetness.	Unsuited	Unsuited	Poor: excess salt.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Irigul:				
[1]27:				
Irigul part	Poor: thin layer, area reclaim.	Unsuited	Poor: excess fines.	Poor: slope, area reclaim, small stones.
Rock outcrop part.				
Lander:				
28, [1]29	Fair: low strength, wetness, frost action.	Unsuited	Unsuited	Good.
Leavitt:				
30	Fair: shrink-swell, low strength, frost action.	Unsuited	Unsuited	Fair: too clayey.
[1]31:				
Leavitt part	Fair: shrink-swell, low strength, frost action.	Unsuited	Unsuited	Fair: slope, too clayey.
Rock outcrop part.				
Lupinto:				
32, 33, 34	Fair: area reclaim.	Unsuited	Poor: excess fines.	Poor: thin layer.
35	Fair: wetness.	Unsuited	Poor: excess fines.	Poor: thin layer, area reclaim.
Patent:				
36	Poor: low strength.	Unsuited	Unsuited	Fair: too clayey.
37	Poor: low strength.	Unsuited	Unsuited	Fair: slope, too clayey.
38	Poor: low strength.	Unsuited	Unsuited	Fair: excess salt, too clayey.
[1]39:				
Patent part	Poor: low strength.	Unsuited	Unsuited	Poor: slope.
Forelle part	Fair: low strength.	Unsuited	Unsuited	Fair: slope.
Rock outcrop:				
40.				
[1]41:				
Rock outcrop part.				
Handran part	Poor: large stones, slope.	Unsuited: large stones.	Unsuited: large stones.	Poor: slope, large stones.
Frisco part	Poor: slope.	Unsuited	Unsuited	Poor: small stones, slope.

See footnote at end of table.

TABLE 10.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Rock outcrop: [1]42: Rock outcrop part.				
Highpoint part	Poor: slope, thin layer, area reclaim.	Unsuited	Poor: excess fines.	Poor: slope, thin layer, small stones.
Sapphire: [1]43:				
Sapphire part	Poor: slope, frost action, thin layer.	Unsuited	Unsuited	Poor: slope, large stones.
Duncom part	Poor: slope, thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, area reclaim.
Silas: 44	Fair: low strength, frost action, shrink-swell.	Unsuited	Unsuited	Good.
Sinkson: 45	Fair: slope, low strength.	Unsuited	Unsuited	Good.
46	Fair: slope, low strength.	Unsuited	Unsuited	Fair: slope.
[1]47:				
Sinkson part	Fair: slope, low strength.	Unsuited	Unsuited	Fair: slope.
Thermopolis part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: area reclaim.
[1]48:				
Sinkson part	Fair	Unsuited	Unsuited	Poor: slope.
Thermopolis part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, area reclaim.
Thermopolis: [1]49:				
Thermopolis part	Poor: thin layer, area reclaim.	Unsuited	Unsuited	Poor: slope, area reclaim.
Sinkson part	Fair	Unsuited	Unsuited	Poor: slope.
Ustic Torrifluvents: [1]50:				
Ustic Torrifluvents part		Unsuited	Unsuited.	
Aeric Fluvaquents part	Poor: wetness.	Unsuited	Unsuited	Poor: wetness.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 11.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ansel:						
1	Slope, seepage.	Low strength, compressible, shrink-swell.	----------	----------	Slope, erodes easily	Slope.
Blackhall:						
2:						
Blackhall part	Slope, depth to rock.	Low strength, thin layer.	----------	----------	Slope, depth to rock	Slope, rooting depth.
Carmody part	Slope, depth to rock.	Low strength, piping.	----------	----------	Slope, depth to rock piping.	Slope, erodes easily, rooting depth.
Blazon:						
3:						
Blazon part	Slope, depth to rock.	Thin layer	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.
Patent part	Slope	Low strength, shrink-swell.	Slope, pers slowly.	Slope, slow intake.	Slope, pers slowly, erodes easily	Slope, pers slowly, erodes easily.
4:						
Blazon part	Slope, depth to rock.	Thin layer	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.
Rock outcrop part.						
Cotha:						
5:						
Cotha part	Seepage, depth to rock, slope.	Seepage, piping.	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.
Rock outcrop part.						
Blazon part	Slope, depth to rock.	Thin layer	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.
Crownest:						
6:						
Crownest part	Slope, depth to rock, seepage.	Thin layer, seepage, piping.	----------	----------	Slope, depth to rock piping.	Slope, rooting depth.
Cotha part	Seepage, depth to rock, slope.	Seepage, piping.	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.
Blazon part	Slope, depth to rock.	Thin layer	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.
Delphill:						
7	Slope, depth to rock, seepage.	Thin layer, low strength, hard to pack.	Complex slope, depth to rock	Complex slope, rooting depth	Depth to rock, rooting depth	Slope.
Diamondville:						
8	Slope, depth to rock.	Piping, low strength.	Slope, depth to rock	Slope, rooting depth	Depth to rock	Rooting depth.
9	Slope, depth to rock.	Piping, low strength.	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Diamondville:						
†10:						
Diamondville part	Slope, depth to rock.	Piping, low strength.	Slope, depth to rock	Slope, rooting depth	Depth to rock	Rooting depth.
Forelle part	Slope, seepage.	Low strength, piping.	Slope	Slope	Favorable	Favorable.
†11:						
Diamondville part	Slope, depth to rock.	Piping, low strength.	Slope, depth to rock	Slope, rooting depth	Slope, depth to rock	Slope, rooting depth.
Highpoint part	Slope, depth to rock.	Thin layer	---	---	Slope, depth to rock	Slope, rooting depth.
Duncom:						
†12:						
Duncom part	Slope, depth to rock, seepage.	Thin layer	---	---	Slope, depth to rock	Slope, rooting depth.
Farlow part	Slope, depth to rock.	Favorable	---	---	Slope	Slope.
Rock outcrop part.						
Elkol:						
13	Slope	Low strength, shrink-swell.	Slope, excess sodium perms slowly.	Slope, excess sodium slow intake.	Perms slowly	Excess sodium, perms slowly.
†14:						
Elkol part	Favorable	Low strength, shrink-swell.	Excess sodium, perms slowly.	Excess sodium, slow intake.	Perms slowly	Excess sodium, perms slowly.
Patent part	Slope	Low strength, shrink-swell.	Slope, perms slowly.	Slope, slow intake.	Perms slowly, erodes easily	Perms slowly, erodes easily.
Farlow:						
†15:						
Farlow part	Slope, depth to rock.	Favorable	---	---	Slope	Slope.
Duncom part	Slope, depth to rock, seepage.	Thin layer	---	---	Slope, depth to rock	Slope, rooting depth.
Fluvaquents:						
16	---	Wetness	Wetness	Wetness	Wetness.	
Fluvents:						
17.						
Forelle:						
19, 20	Slope, seepage.	Low strength, piping.	Slope	Slope	Favorable	Favorable.
Frisco:						
†21:						
Frisco part	Slope, seepage.	Large stones	---	---	Slope, large stones.	Slope, droughty.
Handran part	Seepage, slope.	Large stones, seepage.	---	---	Large stones, slope.	Large stones, slope.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Frisco:						
†21:						
Rock outcrop part.						
Handran:						
†22:						
Handran part	Seepage, slope.	Large stones, seepage.			Large stones, slope.	Large stones, slope.
Leavitt part	Slope, seepage.	Low strength, shrink-swell, piping.	Slope	Slope	Favorable.	
†23:						
Handran part	Seepage, slope.	Large stones, seepage.			Large stones, slope.	Large stones, slope.
Midelight part	Slope	Favorable			Slope	Slope.
Havre:						
24	Seepage	Low strength, piping.	Slope	Slope, erodes easily	Favorable	Favorable.
†25:						
Havre part	Seepage	Low strength, piping.	Slope	Slope, erodes easily	Favorable	Favorable.
Elkol part	Slope	Low strength, shrink-swell.	Slope, excess sodium, percs slowly.	Slope, excess sodium, slow intake.	Percs slowly	Excess sodium, percs slowly.
†26:						
Havre part	Seepage	Low strength, piping.	Slope	Slope, erodes easily	Favorable	Favorable.
Elkol part	Slope	Low strength, shrink-swell.	Slope, excess sodium, percs slowly.	Slope, excess sodium, slow intake.	Percs slowly	Excess sodium, percs slowly.
Havre, seeped, part.	Seepage	Piping, low strength.	Slope, excess salt, wetness.	Slope, excess salt, wetness.	Piping, wetness.	Excess salt, droughty, wetness.
Irigul:						
†27:						
Irigul part	Slope, depth to rock.	Thin layer			Slope, depth to rock	Slope, rooting depth.
Rock outcrop part.						
Lander:						
28, †29	Slope	Low strength, piping.	Slope, poor outlets.	Slope, wetness.	Wetness, poor outlets.	Wetness.
Leavitt:						
30	Slope, seepage.	Low strength, shrink-swell, piping.	Slope	Slope	Favorable.	
†31:						
Leavitt part	Slope, seepage.	Low strength, shrink-swell, piping.	Slope	Slope	Slope.	
Rock outcrop part.						

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Lupinto:						
32, 33, 34	Slope, seepage.	Seepage, piping.	Slope, cutbanks cave	Slope, droughty.	Piping	Droughty.
35	Slope, seepage.	Seepage, piping.	Slope, excess salt, cutbanks cave	Slope, wetness, excess salt.	Wetness, piping.	Excess salt, wetness.
Patent:						
36, 37	Slope	Low strength, shrink-swell.	Slope, percs slowly.	Slope, slow intake.	Percs slowly, erodes easily	Percs slowly, erodes easily.
38	Slope	Low strength, shrink-swell.	Slope, percs slowly, excess salt.	Slope, excess salt, wetness.	Percs slowly, wetness.	Excess salt, percs slowly, wetness.
†39:						
Patent part	Slope	Low strength, shrink-swell.	Slope, percs slowly.	Slope, slow intake.	Slope, percs slowly, erodes easily	Slope, percs slowly, erodes easily.
Forelle part	Slope, seepage.	Low strength, piping.	Slope	Slope	Favorable	Favorable.
Rock outcrop:						
40.						
†41:						
Rock outcrop part.						
Handran part	Seepage, slope.	Large stones, seepage.			Large stones, slope.	Large stones, slope.
Frisco part	Slope, seepage.	Large stones			Slope, large stones.	Slope, droughty.
†42:						
Rock outcrop part.						
Highpoint part	Slope, depth to rock.	Thin layer			Slope, depth to rock	Slope, rooting depth.
Sapphire:						
†43:						
Sapphire part	Slope, depth to rock, seepage.	Thin layer, large stones.			Slope, depth to rock	Slope, rooting depth.
Duncom part	Slope, depth to rock, seepage.	Thin layer			Slope, depth to rock	Slope, rooting depth.
Silas:						
44	Slope	Low strength, piping.	Slope	Slope	Piping, wetness.	Wetness.
Sinkson:						
45, 46	Slope, seepage.	Low strength, piping, erodes easily.	Slope	Slope, erodes easily	Erodes easily, piping.	Erodes easily.
†47:						
Sinkson part	Slope, seepage.	Low strength, piping, erodes easily.	Slope	Slope, erodes easily	Erodes easily, piping.	Erodes easily.

See footnote at end of table.

TABLE 11.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
Sinkson:						
[1]47:						
Thermopolis part	Slope, depth to rock.	Low strength, piping, thin layer.	----------	----------	Depth to rock, erodes easily	Rooting depth, erodes easily.
[1]48:						
Sinkson part	Slope, seepage.	Low strength, piping, erodes easily.	Slope	Slope, erodes easily	Slope, erodes easily piping.	Slope, erodes easily.
Thermopolis part	Slope, depth to rock.	Low strength, piping, thin layer.	----------	----------	Slope, depth to rock erodes easily	Slope, rooting depth, erodes easily.
Thermopolis:						
[1]49:						
Thermopolis part	Slope, depth to rock.	Low strength, piping, thin layer.	----------	----------	Slope, depth to rock erodes easily	Slope, rooting depth, erodes easily.
Sinkson part	Slope, seepage.	Low strength, piping, erodes easily.	Slope	Slope, erodes easily	Slope, erodes easily piping.	Slope, erodes easily.
Ustic Torrifluvents:						
[1]50:						
Ustic Torrifluvents part	----------	----------	Floods	Floods.		
Aeric Fluvaquents part	----------	----------	Wetness, floods.	Wetness, floods.		

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 12.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Ansel:				
1	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Blackhall:				
12:				
Blackhall part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Carmody part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
Blazon:				
13:				
Blazon part	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope, depth to rock.	Moderate: too clayey.
Patent part	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
14:				
Blazon part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop part.				
Cotha:				
15:				
Cotha part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Rock outcrop part.				
Blazon part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope, too clayey.
Crownest:				
16:				
Crownest part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope.
Cotha part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Blazon part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope, too clayey.
Delphill:				
7	Slight	Slight	Severe: slope.	Slight.
Diamondville:				
8	Slight	Slight	Severe: slope.	Slight.
9	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Diamondville:				
10:				
Diamondville part	Slight	Slight	Severe: slope.	Slight.
Forelle part	Slight	Slight	Severe: slope.	Slight.
11:				
Diamondville part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Highpoint part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.
Duncom:				
12:				
Duncom part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Farlow part	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Rock outcrop part.				
Elkol:				
13	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
14:				
Elkol part	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
Patent part	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Farlow:				
15:				
Farlow part	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.
Duncom part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Fluvaquents:				
16	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Fluvents:				
17	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Forelle:				
19	Slight	Slight	Moderate: slope.	Slight.
20	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Frisco:				
21:				
Frisco part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Frisco:				
†21:				
Handran part	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.
Rock outcrop part.				
Handran:				
†22:				
Handran part	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, small stones.
Leavitt part	Slight	Slight	Severe: slope.	Slight.
†23:				
Handran part	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
Midelight part	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.
Havre:				
24	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
†25:				
Havre part	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
Elkol part	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
†26:				
Havre part	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
Elkol part	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
Havre, seeped, part.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.
Irigul:				
†27:				
Irigul part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.
Rock outcrop part.				
Lander:				
28, †29	Severe: floods.	Moderate: floods.	Severe: floods.	Slight.
Leavitt:				
30	Slight	Slight	Moderate: slope.	Slight.
†31:				
Leavitt part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Rock outcrop part.				

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Lupinto:				
32	Slight	Slight	Moderate: slope, small stones.	Slight.
33	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
34	Slight	Slight	Severe: slope.	Slight.
35	Moderate: wetness, too clayey.	Moderate: wetness, too clayey.	Moderate: slope, wetness, too clayey.	Moderate: wetness, too clayey.
Patent:				
36	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.
37	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.
38	Moderate: wetness, too clayey.	Moderate: too clayey, wetness.	Moderate: slope, too clayey, wetness.	Moderate: too clayey.
†39:				
Patent part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.
Forelle part	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Rock outcrop:				
40.				
†41:				
Rock outcrop part.				
Handran part	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.
Frisco part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
†42:				
Rock outcrop part.				
Highpoint part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.
Sapphire:				
†43:				
Sapphire part	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Severe: slope.
Duncom part	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
Silas:				
44	Severe: floods.	Moderate: floods, wetness.	Severe: floods.	Slight.
Sinkson:				
45	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.
46	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
[1]47:				
Sinkson part	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.
Thermopolis part	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope, depth to rock.	Moderate: dusty.
[1]48:				
Sinkson part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
Thermopolis part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope, dusty.
Thermopolis:				
[1]49:				
Thermopolis part	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Moderate: slope, dusty.
Sinkson part	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.
Ustic Torrifluvents:				
[1]50:				
Ustic Torrifluvents part	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Aeric Fluvaquents part	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 13.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ansel:												
1	Poor	Poor	Good	---	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Blackhall:												
2:												
Blackhall part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Carmody part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Blazon:												
3:												
Blazon part	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Patent part	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
4:												
Blazon part	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Rock outcrop part.												
Cotha:												
5:												
Cotha part	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Rock outcrop part.												
Blazon part	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Crownest:												
6:												
Crownest part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Cotha part	Fair	Good	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Blazon part	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Delphill:												
7	Fair	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Diamondville:												
8, 9	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
10:												
Diamondville part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Forelle part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Diamondville:												
[1]11:												
Diamondville part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Highpoint part	Very poor.	Very poor.	Poor	---	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Duncom:												
[1]12:												
Duncom part	Very poor.	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Farlow part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop part.												
Elkol:												
13	Poor	Poor	Poor	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
[1]14:												
Elkol part	Poor	Poor	Poor	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Patent part	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Farlow:												
[1]15:												
Farlow part	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Duncom part	Very poor.	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Fluvaquents:												
16	Very poor.	Poor	Poor	---	---	Poor	Good	Very poor.	Poor	---	Fair	Poor.
Fluvents:												
17	Poor	Poor	Fair	---	---	Fair	Fair	Poor	Poor	---	Poor	Fair.
Forelle:												
19, 20	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Frisco:												
[1]21:												
Frisco part	Very poor.	Very poor.	Fair	---	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Handran part	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop part.												
Handran:												
[1]22:												
Handran part	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Leavitt part	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Handran:												
[1]23:												
Handran part----	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Midelight part--	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Havre:												
24----------	Fair	Good	Fair	Good	---	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
[1]25:												
Havre part------	Fair	Good	Fair	Good	---	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Elkol part------	Poor	Poor	Poor	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
[1]26:												
Havre part------	Fair	Good	Fair	Good	---	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Elkol part------	Poor	Poor	Poor	---	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Havre, seeped, part.	Poor	Poor	Poor	---	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Poor.
Irigul:												
[1]27:												
Irigul part-----	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop part.												
Lander:												
28, [1]29----------	Poor	Poor	Fair	---	---	Fair	Fair	Very poor.	Poor	---	Poor	Fair.
Leavitt:												
30----------	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
[1]31:												
Leavitt part----	Fair	Good	Good	---	---	Good	Poor	Very poor.	Good	---	Very poor.	Good.
Rock outcrop part.												
Lupinto:												
32, 33, 34--------	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
35----------	Poor	Poor	Fair	---	---	Fair	Fair	Very poor.	Poor	---	Poor	Fair.
Patent:												
36, 37----------	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
38----------	Poor	Poor	Fair	---	---	Fair	Fair	Poor	Poor	---	Poor	Fair.
[1]39:												
Patent part-----	Poor	Poor	Fair	---	---	Fair	Fair	Poor	Poor	---	Poor	Fair.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Patent:												
[1]39:												
Forelle part----	Poor	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop:												
40.												
[1]41:												
Rock outcrop part.												
Handran part----	Very poor.	Very poor.	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Frisco part-----	Very poor.	Very poor.	Fair	---	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
[1]42:												
Rock outcrop part.												
Highpoint part--	Very poor.	Very poor.	Poor	---	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
Sapphire:												
[1]43:												
Sapphire part---	Very poor.	Very poor.	Good	---	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Good.
Duncom part-----	Very poor.	Poor	Fair	---	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Silas:												
44----------	Poor	Poor	Good	Good	---	Good	Poor	Very poor.	Poor	---	Very poor.	Good.
Sinkson:												
45, 46----------	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
[1]47:												
Sinkson part----	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Thermopolis part----------	Very poor.	Poor	Good	---	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
[1]48:												
Sinkson part----	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Thermopolis part----------	Very poor.	Poor	Good	---	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Thermopolis:												
[1]49:												
Thermopolis part----------	Very poor.	Poor	Good	---	---	Good	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Sinkson part----	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 13.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
Ustic Torrifluvents: [1]50:												
Ustic Torrifluvents part	Poor	Poor	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
Aeric Fluvaquents part	Poor	Poor	Good	---	---	Good	Good	Good	Fair	---	Good	Good.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means greater than. Absence of an entry indicates that the data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ansel:											
1----------	0-5	Loam----------	ML	A-4	0	90-100	75-100	65-95	50-70	25-35	NP-10
	5-42	Clay loam, loam-	CL	A-6	0-5	90-100	75-100	65-90	55-75	25-40	10-20
	42-60	Loam, clay loam, gravelly loam.	CL, SC	A-6	0-5	75-100	50-95	45-90	40-75	25-40	10-20
Blackhall:											
[1]2:											
Blackhall part--	0-12	Gravelly very fine sandy loam.	SM	A-2, A-4	0-5	65-80	60-75	50-70	30-40	10-20	NP-5
	12	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Carmody part-----	0-25	Very fine sandy loam.	ML	A-4	0-5	85-100	85-100	75-90	55-85	20-40	NP-10
	25	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Blazon:											
[1]3:											
Blazon part------	0-12	Clay loam--------	CL	A-6	0-5	80-100	80-100	75-95	60-75	35-40	10-20
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Patent part------	0-60	Clay loam--------	CL	A-6, A-7	0-5	95-100	95-100	80-90	70-85	35-45	15-25
[1]4:											
Blazon part------	0-12	Clay loam--------	CL	A-6	0-5	80-100	80-100	75-95	60-75	35-40	10-20
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Cotha:											
[1]5:											
Cotha part-------	0-26	Sandy loam-------	SM, SM-SC	A-2, A-1	0	80-90	75-90	45-65	20-35	15-25	NP-5
	26	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Blazon part------	0-12	Clay loam--------	CL	A-6	0-5	80-100	80-100	75-95	60-75	35-40	10-20
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Crownest:											
[1]6:											
Crownest part----	0-3	Loamy sand-------	SM	A-2	0-5	80-100	80-100	50-60	15-35	---	NP
	3-10	Sandy loam-------	SM	A-2	0-5	80-100	80-100	50-65	25-35	---	NP
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Cotha part-------	0-26	Sandy loam-------	SM, SM-SC	A-2, A-1	0	80-90	75-90	45-65	20-35	15-25	NP-5
	26	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Blazon part------	0-12	Clay loam--------	CL	A-6	0-5	80-100	80-100	75-95	60-75	35-40	10-20
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Delphill:											
7	0-2	Clay loam	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	2-24	Loam, clay loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	85-95	65-85	25-35	5-15
	24	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Diamondville:											
8, 9	0-3	Loam	CL-ML	A-4	0-5	95-100	90-100	85-95	60-75	15-25	5-10
	3-12	Clay loam	CL	A-6, A-7	0-5	95-100	90-100	85-95	70-80	35-45	15-25
	12-22	Loam	CL-ML	A-4	0-5	95-100	90-100	85-95	60-75	15-25	5-10
	22	Weathered bedrock.	---	---	---	---	---	---	---	---	---
†10:											
Diamondville part	0-3	Loam	CL-ML	A-4	0-5	95-100	90-100	85-95	60-75	15-25	5-10
	3-12	Clay loam	CL	A-6, A-7	0-5	95-100	90-100	85-95	70-80	35-45	15-25
	12-22	Loam	CL-ML	A-4	0-5	95-100	90-100	85-95	60-75	15-25	5-10
	22	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Forelle part	0-2	Sandy clay loam	SM	A-4	0-10	85-100	85-100	65-80	40-50	---	NP
	2-26	Clay loam, loam	CL	A-6	0-10	85-100	85-100	80-100	55-80	25-40	10-15
	26-60	Loam, clay loam	CL-ML, ML	A-4	0-10	85-100	85-100	75-100	55-75	25-35	5-10
†11:											
Diamondville part	0-3	Loam	CL-ML	A-4	0-5	95-100	90-100	85-95	60-75	15-25	5-10
	3-12	Clay loam	CL	A-6, A-7	0-5	95-100	90-100	85-95	70-80	35-45	15-25
	12-22	Loam	CL-ML	A-4	0-5	95-100	90-100	85-95	60-75	15-25	5-10
	22	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Highpoint part	0-7	Channery silty clay loam.	CL, GC	A-6	0-5	50-80	50-80	45-80	35-75	20-40	10-20
	7	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Duncom:											
†12:											
Duncom part	0-9	Loam	ML	A-4	0-10	80-90	75-85	55-75	50-70	15-25	NP-5
	9-16	Channery loam	GM, ML	A-2, A-4	0-10	55-90	50-85	35-85	25-75	15-25	NP-5
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Farlow part	0-9	Channery loam	ML, GM	A-4	5-10	70-80	65-75	60-70	40-55	15-25	NP-5
	9-46	Very channery loam.	GM, GP-GM	A-1	5-10	10-40	10-40	10-35	5-25	15-25	NP-5
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Elkol:											
†13	0-3	Clay loam	CL, CH	A-7	0-5	95-100	95-100	90-100	70-90	40-65	15-35
	3-60	Silty clay, clay, clay loam.	CL, CH	A-7	0-5	95-100	95-100	90-100	70-90	40-65	15-35
†14:											
Elkol part	0-3	Clay loam	CL, CH	A-7	0-5	95-100	95-100	90-100	70-90	40-65	15-35
	3-60	Silty clay, clay, clay loam.	CL, CH	A-7	0-5	95-100	95-100	90-100	70-90	40-65	15-35

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Elkol:											
†14:											
Patent part-----	0-60	Clay loam-------	CL	A-6, A-7	0-5	95-100	95-100	80-90	70-85	35-45	15-25
Farlow:											
†15:											
Farlow part-----	0-9	Channery loam---	ML, GM	A-4	5-10	70-80	65-75	60-70	40-55	15-25	NP-5
	9-46	Very channery loam.	GM, GP-GM	A-1	5-10	10-40	10-40	10-35	5-25	15-25	NP-5
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Duncom part-----	0-9	Loam------------	ML	A-4	0-10	80-90	75-85	55-75	50-70	15-25	NP-5
	9-16	Channery loam---	GM, ML	A-2, A-4	0-10	55-90	50-85	35-85	25-75	15-25	NP-5
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Fluvaquents:											
16----------	0-60	Variable--------	---	---	---	---	---	---	---	---	---
Fluvents:											
17----------	0-60	Variable--------	---	---	---	---	---	---	---	---	---
Forelle:											
19, 20------	0-2	Sandy clay loam-	SM	A-4	0-10	85-100	85-100	65-80	40-50	---	NP
	2-26	Clay loam-------	CL	A-6	0-10	85-100	85-100	80-100	55-80	25-40	10-15
	26-60	Loam, clay loam-	CL-ML, ML	A-4	0-10	85-100	85-100	75-100	55-75	25-35	5-10
Frisco:											
†21:											
Frisco part-----	0-16	Gravelly loam---	GM, ML, SM	A-2, A-4	0-5	55-90	50-75	50-75	30-60	15-20	NP-5
	16-60	Very stony clay loam, very cobbly clay loam, very gravelly clay loam.	GC, SC	A-2	35-50	50-75	35-60	30-40	20-35	25-35	10-15
Handran part----	0-10	Very stony loam-	SM, GM	A-1, A-2, A-4	65-80	60-70	40-60	30-50	10-40	15-25	NP-5
	10-60	Very gravelly coarse sandy loam.	SM	A-1, A-2	50-65	65-75	50-65	35-45	15-30	15-25	NP-5
Rock outcrop part.											
Handran:											
†22:											
Handran part----	0-10	Very stony loam-	SM, GM	A-1, A-2, A-4	65-80	60-70	40-60	30-50	10-40	15-25	NP-5
	10-60	Very gravelly coarse sandy loam.	SM	A-1, A-2	50-65	65-75	50-65	35-45	15-30	15-25	NP-5
Leavitt part----	0-6	Loam------------	ML	A-4	0	75-100	75-100	70-100	60-80	25-35	NP-5
	6-22	Clay loam-------	CL	A-6	0	75-100	75-100	70-100	55-80	25-40	10-15
	22-60	Loam------------	ML	A-4	0	75-100	75-100	65-90	50-70	25-40	NP-10
†23:											
Handran part----	0-10	Very channery loam.	GM	A-2	20-30	45-55	40-50	35-45	25-35	15-25	NP-5
	10-60	Very channery coarse sandy loam.	SM	A-1, A-2	50-65	65-75	50-65	35-45	15-30	15-25	NP-5

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Handran:											
[1]23:											
Midelight part--	0-40	Very channery loam.	GM	A-1, A-2	0-5	30-50	30-50	25-45	20-35	15-25	NP-5
	40	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Havre:											
24----------	0-6	Clay loam-------	ML, CL-ML	A-4	0	100	100	80-95	60-75	20-30	NP-10
	6-60	Stratified clay loam to sandy loam.	CL-ML, CL	A-4, A-6	0	100	100	80-95	60-75	25-35	5-15
[1]25:											
Havre part------	0-6	Clay loam-------	ML, CL-ML	A-4	0	100	100	80-95	60-75	20-30	NP-10
	6-60	Stratified clay loam to sandy loam.	CL-ML, CL	A-4, A-6	0	100	100	80-95	60-75	25-35	5-15
Elkol part------	0-3	Clay loam-------	CL, CH	A-7	0-5	95-100	95-100	90-100	70-90	40-65	15-35
	3-60	Silty clay, clay, clay loam.	CL, CH	A-7	0-5	95-100	95-100	90-100	70-90	40-65	15-35
[1]26:											
Havre part------	0-6	Clay loam-------	ML, CL-ML	A-4	0	100	100	80-95	60-75	20-30	NP-10
	6-60	Stratified clay loam to sandy loam.	CL-ML, CL	A-4, A-6	0	100	100	80-95	60-75	25-35	15-35
Elkol part------	0-3	Clay loam-------	CL, CH	A-7	0-5	95-100	95-100	90-100	70-90	40-65	15-35
	3-60	Silty clay, clay, clay loam.	CL, CH	A-7	0-5	95-100	95-100	90-100	70-90	40-65	15-35
Havre, seeped, part.	0-8	Clay loam-------	ML, CL-ML	A-4	0	100	100	85-95	60-75	20-30	NP-10
	8-60	Stratified clay loam to sandy loam.	CL-ML, CL	A-4, A-6	0	100	100	80-95	60-75	25-35	5-15
Irigul:											
[1]27:											
Irigul part-----	0-13	Channery loam---	GC, CL-ML, CL, GM-GC	A-4, A-6	5-10	55-75	55-75	50-65	35-55	20-30	5-15
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop part.											
Lander:											
28, [1]29----------	0-60	Loam------------	ML	A-4	0	95-100	95-100	80-95	50-60	20-30	NP-5
Leavitt:											
30----------	0-6	Loam------------	ML	A-4	0	75-100	75-100	70-100	60-80	25-35	NP-5
	6-22	Clay loam-------	CL	A-6	0	75-100	75-100	70-100	55-80	25-40	10-15
	22-60	Loam------------	ML	A-4	0	75-100	75-100	65-90	50-70	25-40	NP-10
[1]31:											
Leavitt part----	0-6	Loam------------	ML	A-4	0	75-100	75-100	70-100	60-80	25-35	NP-5
	6-22	Clay loam-------	CL	A-6	0	75-100	75-100	70-100	55-80	25-40	10-15
	22-60	Loam------------	ML	A-4	0	75-100	75-100	65-90	50-70	25-40	NP-10
Rock outcrop part.											

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Lupinto:											
32, 33, 34	0-4	Loam	ML	A-4	0-5	85-95	85-95	75-85	55-65	15-25	NP-5
	4-13	Gravelly clay loam.	GC, CL	A-6, A-7	0-5	50-75	50-75	45-70	35-55	35-45	15-20
	13-60	Gravelly loam, very gravelly loam.	GM	A-1, A-2	0-5	30-60	30-55	25-45	20-35	15-30	NP-5
35	0-5	Clay loam	CL	A-6, A-7	0-5	85-95	85-95	80-90	65-70	35-45	15-20
	5-15	Gravelly clay loam.	GC, CL	A-6, A-7	0-5	50-75	50-75	45-70	35-55	35-45	15-20
	15-60	Gravelly loam, very gravelly loam.	GM	A-1, A-2	0-5	30-60	30-55	25-45	20-35	15-30	NP-5
Patent:											
36, 37	0-60	Clay loam	CL	A-6, A-7	0-5	95-100	95-100	80-90	70-85	35-45	15-25
38	0-60	Clay loam	CL	A-6, A-7	0-5	95-100	95-100	80-90	70-85	25-45	15-25
[1]39:											
Patent part	0-60	Clay loam	CL	A-6, A-7	0-5	95-100	95-100	80-90	70-85	35-45	15-25
Forelle part	0-2	Sandy clay loam	SM	A-4	0-10	85-100	85-100	65-80	40-50	---	NP
	2-26	Clay loam, loam	CL	A-6	0-10	85-100	85-100	80-100	55-80	25-40	10-15
	26-60	Loam, clay loam	CL-ML, ML	A-4	0-10	85-100	85-100	75-100	55-75	25-35	5-10
Rock outcrop: 40.											
[1]41:											
Rock outcrop part.											
Handran part	0-10	Very stony loam	SM, GM	A-1, A-2, A-4	65-80	60-70	40-60	30-50	10-40	15-25	NP-5
	10-60	Very gravelly coarse sandy loam.	SM	A-1, A-2	50-65	65-75	50-65	35-45	15-30	15-25	NP-5
Frisco part	0-16	Gravelly loam	GM, ML, SM	A-2, A-4	0-5	55-90	50-75	50-75	30-60	15-20	NP-5
	16-60	Very stony clay loam, very cobbly clay loam, very gravelly clay loam.	GC, SC	A-2	35-50	50-75	35-60	30-40	20-35	25-35	10-15
[1]42:											
Rock outcrop part.											
Highpoint part	0-7	Channery silty clay loam.	CL, GC	A-6	0-5	50-80	50-80	45-80	35-75	20-40	10-20
	7	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Sapphire:											
[1]43:											
Sapphire part	0-10	Stony loam	SM, ML	A-4	5-40	80-90	70-80	65-70	40-60	20-40	NP-10
	10-35	Sandy clay loam, stony sandy clay loam.	CL, CL-ML	A-4, A-6	5-40	80-90	70-80	60-75	50-65	25-40	5-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Sapphire:											
[1]43:											
Duncom part	0-9	Loam	ML	A-4	0-10	80-90	75-85	55-75	50-70	15-25	NP-5
	9-16	Channery loam	GM, ML	A-2, A-4	0-10	55-90	50-85	35-85	25-75	15-25	NP-5
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Silas:											
44	0-60	Loam	ML	A-4	0-10	90-100	90-100	80-95	60-85	15-25	NP-5
Sinkson:											
45, 46	0-3	Loam	ML	A-4	0	95-100	95-100	90-95	70-85	20-30	NP-5
	3-60	Loam	ML	A-4	0	95-100	95-100	80-90	60-70	20-30	NP-5
[1]47, [1]48:											
Sinkson part	0-3	Loam	ML	A-4	0	95-100	95-100	90-95	70-85	20-30	NP-5
	3-60	Loam	ML	A-4	0	95-100	95-100	80-90	60-70	20-30	NP-5
Thermopolis part	0-4	Loam	ML	A-4	0	80-100	80-100	70-90	50-70	15-25	NP-5
	4-15	Loam	ML	A-4	0	80-100	80-100	70-90	50-70	15-25	NP-5
	15	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Thermopolis:											
[1]49:											
Thermopolis part	0-4	Loam	ML	A-4	0	80-100	80-100	70-90	50-70	15-25	NP-5
	4-15	Loam	ML	A-4	0	80-100	80-100	70-90	50-70	15-25	NP-5
	15	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Sinkson part	0-3	Loam	ML	A-4	0	95-100	95-100	90-95	70-85	20-30	NP-5
	3-60	Loam	ML	A-4	0	95-100	95-100	80-90	60-70	20-30	NP-5
Ustic Torrifluvents:											
[1]50:											
Ustic Torrifluvents part	0-60	Variable	---	---	---	---	---	---	---	---	---
Aeric Fluvaquents part	0-60	Variable	---	---	---	---	---	---	---	---	---

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 15.--ENGINEERING TEST DATA

[Tests performed by Wyoming State Highway Department in accordance with standard procedures of the American Association of State Highway and Transportation Officials (AASHTO)]

Soil name and location	Report no.	Depth	Horizon	[1]Percentage passing sieve-- No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	Liquid limit	Plasticity index	[2]Classification AASHTO	Unified
		In						Pct			
Ansel loam: SE1/4NE1/4 sec. 30, T. 30 N., R. 99 W.	74-891	5-30	B2t	75	72	69	51.7	45	24	A-7-6 (8)	CL
	74-892	42-60	C	89	89	88	36.4	31	12	A-6 (1)	SC
Carmody very fine sandy loam: SE1/4SE1/4 sec. 3, T. 30 N., R 96 W.	74-885	8-25	C	100	100	100	85.3	36	5	A-4 (8)	ML
Cotha fine sandy loam: SE1/4SW1/4 sec. 10, T 33 N., R. 100 W.	74-883	9-17	B2t	93	91	88	28.7	--	[3]NP	A-2-4 (0)	SM
Farlow channery loam: 1,800 feet N. and 240 feet E. of SW corner of sec. 18, T. 30 N., R. 99 W.	74-884	30-40	C	39	29	20	14.5	23	1	A-1-2 (0)	GM
Forelle sandy clay loam: SW1/4SW1/4 sec. 14, T. 32 N., R. 99 W.	74-889	5-12	B2t	100	99.8	99	70.3	40	22	A-6 (12)	CL
Frisco gravelly loam: NE1/4SW1/4 sec. 11, T. 31 N., R. 101 W.	74-880	24-60	C	81	70	37	14.7	--	NP	A-1-b (0)	SM
Handran very stony loam: SW1/4NW1/4 sec. 24, T. 32 N., R. 101 W.	74-882	16-60	C	73	65	34	13.7	--	NP	A-1-b (0)	SM
Lander loam: NW1/4NE1/4 sec. 35, T. 33 N., R. 99 W.	74-890	14-60	C	100	98	92	53.6	--	NP	A-4 (4)	ML
Lupinto clay loam: SW1/4NE1/4 sec. 19, T. 33 N., R. 99 W.	74-887	4-13	B2t	98	94	82	60.7	35	16	A-6 (7)	CL
Midelight channery loam: NE1/4SE1/4 sec. 32, T. 30 N., R. 99 W.	74-893	8-40	C	65	62	55	28.3	--	NP	A-2-4 (0)	SM

See footnotes at end of table.

TABLE 15.--ENGINEERING TEST DATA

Soil name and location	Report no.	Depth	Horizon	[1]Percentage passing sieve--				Liquid limit	Plasticity index	[2]Classification	
				No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)			AASHTO	Unified
		In						Pct			
Patent clay loam: NW1/4SW1/4 sec. 1, T. 31 N., R. 97 W.	74-888	3-20	C	100	100	99.6	69.9	32	13	A-6 (8)	CL
Sinkson loam: SE1/4NE1/4 sec. 5, T. 31 N., R. 98 W.	74-886	12-60	C	91	91	91	82.8	23	3	A-4 (8)	ML

[1]Analysis according to AASHTO Designation T88-57 (1). Results by this procedure frequently differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for use in naming textural classes for soil.

[2]AASHTO classification by Wyoming Highway Department; Unified classification made using Wyoming Highway Department data.

[3]NP = Nonplastic.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means greater then. Entries under "Erosion factors--T" apply to the entire profile. Absence of an entry means data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
Ansel:											
1	0-5	2.0-6.0	0.14-0.17	6.1-7.3	<2	Low	High	Low	0.28	5	5
	5-42	0.6-2.0	0.16-0.20	6.1-6.5	<2	Moderate	High	Low	0.32		
	42-60	0.6-2.0	0.16-0.18	5.6-7.3	<2	Moderate	High	Low	0.17		
Blackhall:											
[1]2:											
Blackhall part	0-12	0.6-2.0	0.10-0.14	7.9-8.4	<2	Low	High	Moderate	0.32	1	3
	12	---	---	---	---	---	---	---	---		
Carmody part	0-25	0.6-2.0	0.14-0.18	7.9-8.4	<2	Low	High	Moderate	0.37	3	3
	25	---	---	---	---	---	---	---	---		
Blazon:											
[1]3:											
Blazon part	0-12	0.2-0.6	0.19-0.21	7.9-9.0	2-4	Moderate	High	Low	0.43	1	4L
	12	---	---	---	---	---	---	---	---		
Patent part	0-60	0.6-2.0	0.19-0.21	7.9-8.4	<2	Moderate	High	Low	0.32	5	4L
[1]4:											
Blazon part	0-12	0.2-0.6	0.19-0.21	7.9-9.0	2-4	Moderate	High	Low	0.43	1	4L
	12	---	---	---	---	---	---	---	---		
Rock outcrop part.											
Cotha:											
[1]5:											
Cotha part	0-26	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low	High	Low	0.28	2	3
	26	---	---	---	---	---	---	---	---		
Rock outcrop part.											
Blazon part	0-12	0.2-0.6	0.19-0.21	7.9-9.0	2-4	Moderate	High	Low	0.43	1	4L
	12	---	---	---	---	---	---	---	---		
Crownest:											
[1]6:											
Crownest part	0-3	2.0-6.0	0.06-0.13	7.4-7.8	<2	Low	Moderate	Low	0.28	1	2
	3-10	2.0-6.0	0.11-0.13	7.4-7.8	<2	Low	High	Low	0.28		
	10	---	---	---	---	---	---	---	---		
Cotha part	0-26	2.0-6.0	0.11-0.13	6.6-7.8	<2	Low	High	Low	0.28	2	3
	26	---	---	---	---	---	---	---	---		
Blazon part	0-12	0.2-0.6	0.19-0.21	7.9-9.0	2-4	Moderate	High	Low	0.43	1	4L
	12	---	---	---	---	---	---	---	---		
Delphill:											
7	0-2	0.6-2.0	0.16-0.20	7.4-9.0	<4	Low	High	Low	0.37	2	5
	2-24	0.6-2.0	0.14-0.20	7.9-9.0	<4	Low	High	Low	0.37		
	24	---	---	---	---	---	---	---	---		
Diamondville:											
8, 9	0-3	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low	High	Low	0.37	3	6
	3-12	0.6-2.0	0.19-0.21	7.4-8.4	<2	Moderate	High	Low	0.49		
	12-22	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	High	Low	0.49		
	22	---	---	---	---	---	---	---	---		
[1]10:											
Diamondville part	0-3	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low	High	Low	0.37	3	6
	3-12	0.6-2.0	0.19-0.21	7.4-8.4	<2	Moderate	High	Low	0.49		
	12-22	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	High	Low	0.49		
	22	---	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
Diamondville:											
[1]10:											
Forelle part----	0-2	2.0-6.0	0.13-0.15	6.6-7.8	<2	Low-------	High------	Low-------	0.20	5	3
	2-26	0.6-2.0	0.16-0.21	6.6-9.0	<2	Moderate	High------	Low-------	0.32		
	26-60	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low-------	High------	Low-------	0.28		
[1]11:											
Diamondville part----------	0-3	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low-------	High------	Low-------	0.37	3	6
	3-12	0.6-2.0	0.19-0.21	7.4-8.4	<2	Moderate	High------	Low-------	0.49		
	12-22	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low-------	High------	Low-------	0.49		
	22	---	---	---	---	----------	---------	---------	---		
Highpoint part--	0-7	0.6-2.0	0.09-0.16	6.1-8.4	<2	Low-------	High------	Moderate	0.32	1	6
	7	---	---	---	---	----------	---------	---------	---		
Duncom:											
[1]12:											
Duncom part-----	0-9	0.6-2.0	0.09-0.16	7.4-8.4	<2	Low-------	High------	Low-------	0.32	1	4L
	9-16	0.6-2.0	0.09-0.16	7.9-9.0	<2	Low-------	High------	Low-------	0.49		
	16	---	---	---	---	----------	---------	---------	---		
Farlow part-----	0-9	0.6-2.0	0.12-0.14	7.9-8.4	<2	Low-------	High------	Low-------	0.28	3	8
	9-46	0.6-2.0	0.03-0.07	7.9-9.0	<2	Low-------	High------	Low-------	0.28		
	46	---	---	---	---	----------	---------	---------	---		
Rock outcrop part.											
Elkol:											
13----------	0-3	0.06-0.2	0.14-0.20	>8.4	<16	High------	High------	High------	0.32	5	4
	3-60	0.06-0.2	0.14-0.20	>8.4	<16	High------	High------	High------	0.37		
[1]14:											
Elkol part------	0-3	0.06-0.2	0.14-0.20	>8.4	<16	High------	High------	High------	0.32	5	4
	3-60	0.06-0.2	0.14-0.20	>8.4	<16	High------	High------	High------	0.37		
Patent part-----	0-60	0.6-2.0	0.19-0.21	7.9-8.4	<2	Moderate	High------	Low-------	0.32	5	4L
Farlow:											
[1]15:											
Farlow part-----	0-9	0.6-2.0	0.12-0.14	7.9-8.4	<2	Low-------	High------	Low-------	0.28	3	8
	9-46	0.6-2.0	0.03-0.07	7.9-9.0	<2	Low-------	High------	Low-------	0.28		
	46	---	---	---	---	----------	---------	---------	---		
Duncom part-----	0-9	0.6-2.0	0.09-0.16	7.4-8.4	<2	Low-------	High------	Low-------	0.32	1	4L
	9-16	0.6-2.0	0.09-0.16	7.9-9.0	<2	Low-------	High------	Low-------	0.49		
	16	---	---	---	---	----------	---------	---------	---		
Fluvaquents:											
16----------	0-60	---	---	---	---	----------	---------	---------	---	---	---
Fluvents:											
17----------	0-60	---	---	---	---	----------	---------	---------	---	---	---
Forelle:											
19, 20----------	0-2	2.0-6.0	0.13-0.15	6.6-7.8	<2	Low-------	High------	Low-------	0.20	5	3
	2-26	0.6-2.0	0.16-0.21	6.6-9.0	<2	Moderate	High------	Low-------	0.32		
	26-60	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low-------	High------	Low-------	0.28		
Frisco:											
[1]21:											
Frisco part-----	0-16	2.0-6.0	0.07-0.13	5.1-7.3	<2	Low-------	High------	Moderate	0.17	5	3
	16-60	0.6-2.0	0.05-0.09	5.1-7.3	<2	Low-------	High------	Moderate	0.15		
Handran part----	0-10	6.0-20	0.05-0.07	6.6-7.8	<2	Low-------	Moderate	Low-------	0.10	3	8
	10-60	6.0-20	0.07-0.09	6.6-7.8	<2	Low-------	Moderate	Low-------	0.15		
Rock outcrop part.											

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
Handran:											
[1]22:											
Handran part	0-10	6.0-20	0.05-0.07	6.6-7.8	<2	Low	Moderate	Low	0.10	3	8
	10-60	6.0-20	0.07-0.09	6.6-7.8	<2	Low	Moderate	Low	0.15		
Leavitt part	0-6	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low	High	Low	0.43	5	6
	6-22	0.6-2.0	0.19-0.21	6.1-8.4	<2	Moderate	High	Low	0.32		
	22-60	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	High	Low	0.28		
[1]23:											
Handran part	0-10	6.0-20	0.05-0.07	6.6-7.8	<2	Low	Moderate	Low	0.10	3	8
	10-60	6.0-20	0.07-0.09	6.6-7.8	<2	Low	Moderate	Low	0.15		
Midelight part	0-40	0.6-2.0	0.05-0.09	7.4-8.4	<2	Low	High	Low	0.24	3	8
	40+	---	---	---	---	---	---	---	---		
Havre:											
24	0-6	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low	High	Low	0.28	5	5
	6-60	0.6-2.0	0.14-0.20	7.4-8.4	<8	Moderate	High	Low	0.28		
[1]25:											
Havre part	0-6	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low	High	Low	0.28	5	5
	6-60	0.6-2.0	0.14-0.20	7.4-8.4	<8	Moderate	High	Low	0.28		
Elkol part	0-3	0.06-0.2	0.14-0.20	>8.4	<16	High	High	High	0.32	5	4
	3-60	0.06-0.2	0.14-0.20	>8.4	<16	High	High	High	0.37		
[1]26:											
Havre part	0-6	0.6-2.0	0.16-0.20	7.4-8.4	<2	Low	High	Low	0.28	5	5
	6-60	0.6-2.0	0.14-0.20	7.4-8.4	<8	Moderate	High	Low	0.28		
Elkol part	0-3	0.06-0.2	0.14-0.20	>8.4	<16	High	High	High	0.32	5	4
	3-60	0.06-0.2	0.14-0.20	>8.4	<16	High	High	High	0.37		
Havre, seeped, part.	0-8	0.2-2.0	0.13-0.17	7.4-9.0	4-16	Low	High	Moderate	0.28	5	7
	8-60	0.6-2.0	0.13-0.17	7.4-9.0	4-16	Moderate	High	Moderate	0.28		
Irigul:											
[1]27:											
Irigul part	0-13	0.6-2.0	0.09-0.11	7.4-7.8	<2	Moderate	High	Low	0.28	1	6
	13	---	---	---	---	---	---	---	---		
Rock outcrop part.											
Lander:											
28, [1]29	0-60	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low	High	High	---	---	4L
Leavitt:											
30	0-6	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low	High	Low	0.43	5	6
	6-22	0.6-2.0	0.19-0.21	6.1-8.4	<2	Moderate	High	Low	0.32		
	22-60	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	High	Low	0.28		
[1]31:											
Leavitt part	0-6	0.6-2.0	0.19-0.21	6.6-7.8	<2	Low	High	Low	0.43	5	6
	6-22	0.6-2.0	0.19-0.21	6.1-8.4	<2	Moderate	High	Low	0.32		
	22-60	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	High	Low	0.28		
Rock outcrop part.											
Lupinto:											
32, 33, 34	0-4	0.6-2.0	0.16-0.18	7.4-7.8	<2	Low	High	Moderate	0.32	5	6
	4-13	0.6-2.0	0.10-0.15	7.4-8.4	<2	Moderate	High	Moderate	0.28		
	13-60	6.0-20	0.09-0.12	7.9-9.0	<4	Low	High	High	0.32		
35	0-5	0.6-2.0	0.14-0.16	7.9-8.4	4-8	Moderate	High	High	0.32	5	5
	5-15	0.6-2.0	0.05-0.10	7.9-8.4	4-8	Moderate	High	High	0.28		
	15-60	6.0-20	0.04-0.12	7.9-9.0	<8	Low	High	High	0.32		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete	Erosion factors: K	Erosion factors: T	Wind erodibility group
	In	In/hr	In/in	pH	Mmhos/cm						
Patent:											
36, 37	0-60	0.6-2.0	0.19-0.21	7.9-8.4	<2	Moderate	High	Low	0.32	5	4L
38	0-60	0.6-2.0	0.14-0.16	7.9-9.0	4-8	Moderate	High	High	0.32	5	4L
†39:											
Patent part	0-60	0.6-2.0	0.19-0.21	7.9-8.4	<2	Moderate	High	Low	0.32	5	4L
Forelle part	0-2	2.0-6.0	0.13-0.15	6.6-7.8	<2	Low	High	Low	0.20	5	3
	2-26	0.6-2.0	0.16-0.21	6.6-9.0	<2	Moderate	High	Low	0.32		
	26-60	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low	High	Low	0.28		
Rock outcrop:											
40.											
†41:											
Rock outcrop part.											
Handran part	0-10	6.0-20	0.05-0.07	6.6-7.8	<2	Low	Moderate	Low	0.10	3	8
	10-60	6.0-20	0.07-0.09	6.6-7.8	<2	Low	Moderate	Low	0.15		
Frisco part	0-16	2.0-6.0	0.07-0.13	5.1-7.3	<2	Low	High	Moderate	0.17	5	3
	16-60	0.6-2.0	0.05-0.09	5.1-7.3	<2	Low	High	Moderate	0.15		
†42:											
Rock outcrop part.											
Highpoint part	0-7	0.6-2.0	0.09-0.16	6.1-8.4	<2	Low	High	Moderate	0.32	1	6
	7	---	---	---	---	---	---	---	---		
Sapphire:											
†43:											
Sapphire part	0-10	0.6-2.0	0.12-0.15	5.6-6.5	<2	Low	High	Moderate	0.28	2	8
	10-35	0.6-2.0	0.09-0.13	5.6-7.3	<2	Low	High	Low	0.32		
	35	---	---	---	---	---	---	---	---		
Duncom part	0-9	0.6-2.0	0.09-0.16	7.4-8.4	<2	Low	High	Low	0.32	1	4L
	9-16	0.6-2.0	0.09-0.16	7.9-9.0	<2	Low	High	Low	0.49		
	16	---	---	---	---	---	---	---	---		
Silas:											
44	0-60	0.6-2.0	0.14-0.16	6.6-7.3	<2	Low	High	Low	---	---	6
Sinkson:											
45, 46	0-3	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low	High	High	0.43	5	4L
	3-60	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low	High	High	0.55		
†47:											
Sinkson part	0-3	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low	High	High	0.43	5	4L
	3-60	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low	High	High	0.55		
Thermopolis part	0-4	0.6-2.0	0.15-0.18	7.4-8.4	<4	Low	High	High	0.43	2	4L
	4-15	0.6-2.0	0.15-0.18	7.4-8.4	<4	Low	High	High	0.55		
	15	---	---	---	---	---	---	---	---		
†48:											
Sinkson part	0-3	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low	High	High	0.43	5	4L
	3-60	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low	High	High	0.55		
Thermopolis part	0-4	0.6-2.0	0.15-0.18	7.4-8.4	<4	Low	High	High	0.43	2	4L
	4-15	0.6-2.0	0.15-0.18	7.4-8.4	<4	Low	High	High	0.55		
	15	---	---	---	---	---	---	---	---		
Thermopolis:											
†49:											
Thermopolis part	0-4	0.6-2.0	0.15-0.18	7.4-8.4	<4	Low	High	High	0.43	2	4L
	4-15	0.6-2.0	0.15-0.18	7.4-8.4	<4	Low	High	High	0.55		
	15	---	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Risk of corrosion		Erosion factors		Wind erodibility group
							Uncoated steel	Concrete	K	T	
	In	In/hr	In/in	pH	Mmhos/cm						
Thermopolis:											
[1]49:											
Sinkson part-----	0-3	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low--------	High------	High------	0.43	5	4L
	3-60	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low--------	High------	High------	0.55		
Ustic Torrifluvents:											
[1]50:											
Ustic Torrifluvents part----------	0-60	---	---	---	---	----------	----------	----------	---	---	---
Aeric Fluvaquents part----------	0-60	---	---	---	---	----------	----------	----------	---	---	---

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 17.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means greater than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Ansel:										
1	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Blackhall:										
2:										
Blackhall part	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.
Carmody part	C	None	---	---	>6.0	---	---	20-40	Rippable	Low.
Blazon:										
3:										
Blazon part	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.
Patent part	C	None	---	---	>6.0	---	---	>60	---	Low.
4:										
Blazon part	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.
Rock outcrop part.										
Cotha:										
5:										
Cotha part	C	None	---	---	>6.0	---	---	20-40	Rippable	Low.
Rock outcrop part.										
Blazon part	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.
Crownest:										
6:										
Crownest part	D	None	---	---	>6.0	---	---	10-20	Hard	Low.
Cotha part	C	None	---	---	>6.0	---	---	20-40	Rippable	Low.
Blazon part	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.
Delphill:										
7	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate.
Diamondville:										
8, 9	C	None	---	---	>6.0	---	---	20-40	Rippable	Low.
10:										
Diamondville part	C	None	---	---	>6.0	---	---	20-40	Rippable	Low.
Forelle part	B	None	---	---	>6.0	---	---	>60	---	Low.
11:										
Diamondville part	C	None	---	---	>6.0	---	---	20-40	Rippable	Low.
Highpoint part	C	None	---	---	>6.0	---	---	<10	Rippable	Low.
Duncom:										
12:										
Duncom part	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate.
Farlow part	B	None	---	---	>6.0	---	---	40-60	Hard	Low.
Rock outcrop part.										

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Elkol:										
13	D	None	---	---	>6.0	---	---	>60	---	Low.
[1]14:										
Elkol part	D	None	---	---	>6.0	---	---	>60	---	Low.
Patent part	C	None	---	---	>6.0	---	---	>60	---	Low.
Farlow:										
[1]15:										
Farlow part	B	None	---	---	>6.0	---	---	40-60	Hard	Low.
Duncom part	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate.
Fluvaquents:										
16	D	Rare	---	---	0-0.5	Apparent	Jan-Dec	>60	---	High.
Fluvents:										
17	C	Rare	---	---	2.0-4.0	Apparent	Apr-Sep	>60	---	Moderate.
Forelle:										
19, 20	B	None	---	---	>6.0	---	---	>60	---	Low.
Frisco:										
[1]21:										
Frisco part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Handran part	A	None	---	---	>6.0	---	---	>60	---	Low.
Rock outcrop part.										
Handran:										
[1]22:										
Handran part	A	None	---	---	>6.0	---	---	>60	---	Low.
Leavitt part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
[1]23:										
Handran part	A	None	---	---	>6.0	---	---	>60	---	Low.
Midelight part	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate.
Havre:										
24	B	Rare	---	---	>6.0	Apparent	Mar-Sep	>60	---	Moderate.
[1]25:										
Havre part	B	Rare	---	---	>3.0	Apparent	Mar-Sep	>60	---	Moderate.
Elkol part	D	None	---	---	>3.0	---	---	>60	---	Low.
[1]26:										
Havre part	B	Rare	---	---	>6.0	Apparent	Mar-Sep	>60	---	Moderate.
Elkol part	D	None	---	---	>6.0	---	---	>60	---	Low.
Havre, seeped, part.	C	Rare	---	---	2.5-3.5	Apparent	May-Aug	>60	---	Moderate.
Irigul:										
[1]27:										
Irigul part	D	None	---	---	>6.0	---	---	10-20	Hard	Low.
Rock outcrop part.										
Lander:										
28, [1]29	B	Frequent	Brief	Apr-Jun	2.0-3.0	Apparent	Apr-Oct	>60	---	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Leavitt:										
30	B	None	---	---	>6.0	---	---	>60	---	Moderate.
131:										
Leavitt part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
Rock outcrop part.										
Lupinto:										
32, 33, 34	B	None	---	---	>6.0	---	---	>60	---	Low.
35	C	None	---	---	2.0-4.0	Apparent	Apr-Sep	>60	---	Moderate.
Patent:										
36, 37	C	None	---	---	>6.0	---	---	>60	---	Low.
38	C	None	---	---	2.0-4.0	Apparent	May-Sep	>60	---	Moderate.
139:										
Patent part	C	None	---	---	>6.0	---	---	>60	---	Low.
Forelle part	B	None	---	---	>6.0	---	---	>60	---	Low.
Rock outcrop: 40.										
141:										
Rock outcrop part.										
Handran part	A	None	---	---	>6.0	---	---	>60	---	Low.
Frisco part	B	None	---	---	>6.0	---	---	>60	---	Moderate.
142:										
Rock outcrop part.										
Highpoint part-	C	None	---	---	>6.0	---	---	<10	Rippable	Low.
Sapphire:										
143:										
Sapphire part	B	None	---	---	>6.0	---	---	20-40	Hard	High.
Duncom part	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate.
Silas:										
44	B	Rare	---	---	4.0-6.0	Apparent	Apr-Jul	>60	---	Moderate.
Sinkson:										
45, 46	B	None	---	---	>6.0	---	---	>60	---	Low.
147:										
Sinkson part	B	None	---	---	>6.0	---	---	>60	---	Low.
Thermopolis part	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.
148:										
Sinkson part	B	None	---	---	>6.0	---	---	>60	---	Low.
Thermopolis part	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.
Thermopolis:										
149:										
Thermopolis part	D	None	---	---	>6.0	---	---	10-20	Rippable	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
Thermopolis: [1]49:										
Sinkson part---	B	None---------	---	---	>6.0	---	---	>60	---	Low.
Ustic Torrifluvents: [1]50:										
Ustic Torrifluvents part----------	B	Occasional--	Brief-----	Apr-Aug	4.0-6.0	Apparent	Jan-Dec	>60	---	Moderate.
Aeric Fluvaquents part----------	D	Frequent----	Brief-----	Apr-Aug	0.5-4.0	Apparent	Jan-Dec	>60	---	High.

[1]This map unit is made up of two or more dominant kinds of soil. See map unit description for the composition and behavior of the whole map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

[Asterisk indicates that the soil is a taxadjunct to the series. Classification is the same as for the series]

Soil name	Family or higher taxonomic class
Aeric Fluvaquents	Aeric Fluvaquents
Ansel	Fine-loamy, mixed Typic Cryoboralfs
Blackhall	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Blazon	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Carmody	Coarse-loamy, mixed (calcareous), frigid Ustic Torriorthents
Cotha	Coarse-loamy, mixed Borollic Haplargids
Crownest	Loamy, mixed, nonacid, frigid Lithic Ustic Torriorthents
Delphill	Fine-loamy, mixed (calcareous), frigid Ustic Torriorthents
Diamondville	Fine-loamy, mixed Borollic Haplargids
Duncom	Loamy, mixed Lithic Cryoborolls
Elkol	Fine, montmorillonitic (calcareous), frigid Ustertic Torriorthents
Farlow	Loamy-skeletal, mixed Typic Cryoborolls
Fluvaquents	Fluvaquents
Fluvents	Fluvents
Forelle	Fine-loamy, mixed Borollic Haplargids
*Frisco	Loamy-skeletal, mixed Typic Cryoboralfs
Handran	Loamy-skeletal, mixed Typic Cryoborolls
Havre	Fine-loamy, mixed (calcareous), frigid Ustic Torrifluvents
Highpoint	Loamy-skeletal, mixed, nonacid, frigid, shallow Ustic Torriorthents
Irigul	Loamy-skeletal, mixed Lithic Cryoborolls
Lander	Fine-loamy, mixed Fluvaquentic Haploborolls
Leavitt	Fine-loamy, mixed Argic Cryoborolls
Lupinto	Loamy-skeletal, mixed Borollic Haplargids
Midelight	Loamy-skeletal, mixed Typic Cryoborolls
Patent	Fine-loamy, mixed (calcareous), frigid Ustic Torriorthents
Sapphire	Fine-loamy, mixed Typic Cryoboralfs
Silas	Fine-loamy, mixed Cumulic Cryoborolls
Sinkson	Fine-loamy, mixed (calcareous), frigid Ustic Torriorthents
Thermopolis	Loamy, mixed (calcareous), frigid, shallow Ustic Torriorthents
Ustic Torrifluvents	Ustic Torrifluvents

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